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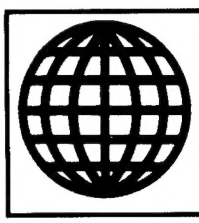
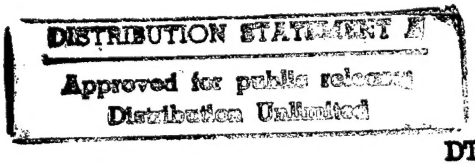
10 JANUARY 1989



JPRS Report

Science & Technology

Europe



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Europe

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ADVANCED MATERIALS

EC Commission Describes Newly Combined BRITE/EURAM Program

3698A340 Brussels EC INFORMATION MEMO in English No P-86, Jul 88 pp 1-2

[Article: "BRITE/EURAM: Research In Industrial Manufacturing Technologies and Advanced Materials Applications"]

[Text] The main aim of the proposal for a new BRITE/EURAM [Basic Research in Industrial Technologies for Europe/European Research in Advanced Materials] program just adopted by the Council [COM(88) 385], is to increase the competitiveness on world markets of the Community's materials sectors and manufacturing industries (e.g., automobiles, textiles, shipbuilding, chemicals, machine tools, construction, aircraft, etc.), by funding research and development work on the technologies needed for the development of new products and processes.

The decision to combine these two programs recognises that the development and application of new advanced materials and the development of new industrial design and manufacturing processes is part of the same basic effort to modernise industrial sectors using the latest technologies. Consequently, no clear distinction can or should be made between programs with these objectives.

The new programs will build on the considerable successes already achieved by BRITE and EURAM, as recognised by external evaluators. Important results are now emerging which could not have happened without an enabling instrument for transborder research collaboration.

Both BRITE and EURAM have helped to meet the need for technical collaboration in Europe. Such collaboration will be a major contributory factor in the establishment of a single market (e.g., harmonization of manufacturing practices; development of joint technical standards, thus avoiding technical barriers to trade, enhancement of the competitiveness of European industry in its home market; maximising the research potential of the Community by combining complementary skills found in different Member States).

Manufacturing industry accounts for 30 percent of the Community GNP and provides employment for around 41 million people, or 75 percent of the industrial work force. It is therefore vital to the Community economy. However, it is experiencing structural difficulties in satisfying a growing demand in the face of ever keener competition. The aim of this Community program is to improve competitiveness by encouraging cross-frontier cooperation between different sectors of industry and between companies, research centres and universities in research focussing on industrial applications at the pre-competitive stage. The program covers advanced materials technologies, design and quality assurance methods for products and processes, applications of manufacturing technologies and technologies for manufacturing processes. Further details will be found in the annex.

In the field of industrial applied research the Community contribution will not exceed 50 percent of the total cost, and industry must find the rest.

Up to 7 percent of the program's budget may be spent on basic research into the development of new materials.

Under a pilot scheme of feasibility awards designed to assist small firms to establish the feasibility of a device, process or concept, the Commission will provide up to 75 percent of the cost with the ceiling of 25,000 ECU.

The budget for the program is 439.5 million ECU, 300 million of which will go to science and technology for manufacturing industry (line 3.1 of the Framework program) and 139.5 million to the science and technology of advanced materials (line 3.2 of the Framework program).

Appendix

1. Advanced Materials Technologies
- Metallic materials & metallic matrix composites;
- Materials for magnetic, optical and superconducting applications;
- High-temperature non-metallic materials (e.g. engineering ceramics, special glasses);
- Polymers and organic matrix composites;
- Materials for special applications (e.g., for food packaging, medical applications).

2. Design Methodology and Assurance of Products and Processes
- Quality, reliability and maintainability in industry (especially for "just-in-time" manufacturing);
- Process and product assurance (advanced testing, measuring, monitoring & control methods).

3. Application of Manufacturing Technologies
- Advancing manufacturing practices (including the transfer and adaptation of technologies used in other sectors);
- Manufacturing processes for flexible materials (including textiles, leather, non-woven materials composites and packaging materials).

4. Technologies for Manufacturing Processes
- Surface techniques (improving resistence to wear, corrosion and high temperatures in industrial application);
- Shaping, assembly and joining technologies;
- Chemical processes (including improved yield in chemical processes, new chemical separation techniques and improved performance of membrane technologies);

- Particle and powder processes (including better techniques to optimise product shape, structure and stability).

New FRG Materials Research Center To Seek Airbus Participation

36980066c Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 14 Nov 88 p 18

[Text] BASF AG, Ludwigshafen—Following investments of DM 50 million, BASF has begun operations at a new research and production center for high-quality composite materials. The company is producing raw materials and semifinished products for aerospace and for the automotive industry there. The market volume of this class of materials is currently estimated at around $2 billion. Based on estimated growth rates, this should increase to around $5 billion by 1995. BASF wants to attain a leading position on this market, the managing directors of this BASF division, Franz Haaf and Gerhard Fahrbach, confirm.

Based on its own research and development work, BASF entered the European market for high-quality composite materials in 1985. That same year, the company had acquired, together with the materials activities of the American firm Celanese, that company's European marketing network. With the startup of the Ludwigshafen production facilities, the European development phase is now completed; the company now has two production sites for manufacturing composite materials. A third production hub will probably be set up in Asia. The Ludwigshafen firm develops and produces these materials on the basis of carbon, glass and armid fibers, as well as special synthetic resins. The special features of these fiber-resin combinations include their extreme mechanical stability under load and their light weight.

The aerospace industry currently has the greatest share in this future market, 70 percent. BASF is in the process of qualifying for numerous European aircraft programs through materials specifications. First and foremost are efforts concerning the Airbus program. The new class of materials has also made inroads into automobile construction, in the form of engine compartment cowling, leaf springs and cardan shafts. Composite fiber technology also has applications in the sports and leisure sector.

Powder Metallurgy Parts Produced for French Rafale Engine

36980022a Paris L'USINE NOUVELLE in French 15 Sep 88 pp 66-67

[Article by Didier Gout: "Ultra-Light Parts for the Rafale Jet Engine"]

[Text] The introduction of extremely light alloy-powder parts in the jet engine of the future combat aircraft propelled Imphy into the ranks of the sector leaders.

Good news for the French aeronautical industry: for the first time, powder-metallurgy parts will be used in a European-built engine. On 26 August, Imphy, a subsidiary of Usinor Sacilor [Northern France Iron & Steel Union/Lorraine Steel Mills], delivered to Snecma [National Company for Aircraft Engine Study and Manufacture] the first semi-products actually manufactured by this process. They will be used to make high- pressure compressor and turbine disks for the M-88 jet engine. This is the engine that will equip the Rafale, the future combat aircraft of the French army in the 1990's; the development stage is expected to be completed in 1989.

A characteristic of these parts, made from a nickel-base alloy powder, is that they are 30 percent lighter than those used in the M-53 jet engine of the Mirage 2000. This accounts in part for the performance characteristics of the Rafale engine. Weighing 900 kg for a thrust of 10.4 tons, it outperforms the M-53 which weighs 600 kg more and provides less thrust.

Why this difference? It is due mostly to powder metallurgy. Various atomization processes are used to produce a powder, each grain of which possesses the characteristics required (elastic limit, heat strength, etc.). The parts obtained by compacting these powders are far more homogeneous than those obtained by traditional ingot forging metallurgy.

The Americans were the first to introduce parts of this type, late in the 1970's, first in a military jet engine, the General Electric F-404 used on the F-18 fighters, then in the Pratt & Whitney 4000 used, among others, on the Boeing 767 and wide-body Airbus.

Imphy's deliveries to Snecma show that the French have caught up. "Imphy and three American companies (Special Metal Corporation, Cameron and Crucible) are now the only companies in the world capable of supplying powder-metallurgy semi-products for jet engines," we were told by Jean-Pierre Auger, head of the powder department.

To acquire its leadership, it took Imphy (1987 sales: Fr1.25 billion; personnel: 1,800) Fr15 million and 10 years of joint research with the School of Mines, Onera [National Office for Aerospace Studies and Research], engine manufacturers and the French air force. To build a powder production line operating under conditions of extreme purity, the company had to develop its own tools at its Imphy (Nievre) steel plant: an inert-gas atomization tower, clean-room powder sifting and conditioning systems, and containerization processes.

As a result of this considerable research effort, the company has acquired a share of the market for metal-base alloy powders destined in particular to the aeronautical and oil industries; forthcoming developments will involve titanium alloy powders.

New Italian Composite Materials Joint Venture Established

3698m005 Rome AIR PRESS in Italian
21 Sep 88 pp 1713-1714

[Text] (AIR PRESS)—The president of Enichem, Antonio Lorenzo Necci, and his counterpart at the Agusta Group, Raffaello Teti signed an equal share agreement on 20 September establishing a new joint venture company, Italcompositi. The new company will carry out research in the field of new composite materials and will produce and market the raw materials and components for these composites. Raffaello Teti, Domenico Tatangelo, Luigi Passini, Mario Artali, Eddo Ferrarini, and Walter Pasqua are all on the new company's board of directors. Raffaello Teti will be president, and Walter Pasqua will be managing director.

A company press release reports that this event is the result of talks which began last January between the Agusta Group and Enichem on cooperation in the field of advanced materials for the aerospace, energy, and high-performance transport sectors. Of particular interest is the possible synergy between the two groups for the introduction of composites in other sectors such as railways and defense.

The press release reports that the annual sales volume is expected to reach 60 billion lire by the end of the first 3 years and 90 billion lire by the fifth year. Although only recently established, Italcompositi has already secured a few significant contracts including the bodywork for the F-40, Ferrari's most prestigious mass-produced car.

Italcompositi's objective is to obtain a 30 to 50 percent market share in Italy and to gradually penetrate the European market. In addition to the initial capital provided by the two partners, investments have been planned to give Italcompositi about 10 billion lire per year for the Pisticci plant for preimpregnated materials which Enichem will donate to the newly established company, and for a new production facility in Anagni [Frosinone]. Human resources will also be required and this will help to improve the employment situation in southern Italy.

The agreement to form the new company stems from an awareness of the considerable market potential for composite materials, and from the increasing number of possible applications in advanced industrial sectors. The new materials weigh less than the traditional ones and ensure higher performance and greater durability. The necessary know-how will come from technologies developed by Agusta and Enichem Tecnoresine in their respective fields of specialization. AIR PRESS recalls that the aerospace sector is certainly the largest application field for these materials. Indeed, future airplanes will no longer be made with traditional alloys, but with metallic and non-metallic new materials, notably carbon fibers.

Both partners have considerable experience in the composites sector. The Agusta Group, one of the most important aerospace companies in the world thanks to many years of research and international cooperation, possesses the necessary know-how as well as the facilities that are the best in Europe. Indeed, the Aerospace Composites Center in Anagni, which will remain part of the Agusta Group due to its strategic activities, is one of the most advanced plants for this type of production. Italcompositi may use Enichem's production technologies for composite materials as well as their basic components, which include epoxy resins produced by Epoxital (a joint venture of Enichem and Dow Chemical) and carbon fibers manufactured by RK Technologies, of which Enichem has a 50 percent share.

AEROSPACE, CIVIL AVIATION

European Aerospace Industries Propose EC R&D Fund

36980066a Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 8 Nov 88 p 14

[Text] Frankfurt/Main, 7 Nov—The European aerospace industry is calling for stronger financial support from the European Community for its research and development projects. This emerges from a study carried out by nine leading European aviation companies, including Messerschmitt-Boelkow-Blohm and Dornier, for the European Commission. The reason for the study was concern that the European aerospace industry could fall behind as a result of intensified, state-supported research activities in the United States and Japan, state subsides for aircraft construction in young industrialized countries such as Brazil or Indonesia, and the weak position of the dollar.

As an immediate measure, the companies propose the creation of a European fund for research and technology, which should supplement national support for key technologies. Furthermore, they advocate stronger cooperation between aerospace companies in Europe as well as a concentration of subsidy money on around 60 technology programs. The industry itself supposedly cannot come up with the money deemed necessary. At present, the European aerospace industry (excluding power unit and supplier firms) spends around DM 750 million a year on research and technology. According to the study, this figure should be increased by 25 percent immediately and in 5 years be around 50 to 60 percent higher than the current level.

From 1980 to 1986, the European aerospace industry was able to achieve a market share of 23 percent for civilian and 28 percent for military aircraft. The total sector, including missile and space construction, employs 480,000 workers in Europe, compared to 1.31 million in the United States. Total turnover amounts to more than DM 60 billion, compared to around DM 213 billion in the United States. Research and development expenditures are equivalent to 15 percent of turnover, compared to 25 percent in the United States (based on 1985 figures).

Telespazio Named Head of European Satellite Consulting Organization

3698m536 Rome AIR PRESS in Italian
13 Sep 88 p 1674

[Text] Telespazio, a member of the IRI-STET group, has recently taken on the presidency of the European consortium ESCO [European Satellite Consulting Organization] for 1988-1989, AIR PRESS reports. The assignment has been given to Eng Giuseppe Quaglione who is in charge of Telespazio's space management division. He has carried out important international assignments in the past, acquiring noteworthy experience and qualifications in the aerospace field.

AIR PRESS recalls that ESCO was established in the beginning of 1983 by the UK's British Teleconsult, Detecon of the FRG, Satel Conseil of France, and Italy's Telespazio to supply assistance and consulting services to regional and worldwide organizations committed to the creation and management of satellite telecommunications systems. Studies and consultations have been carried out to date for the principal international organizations working in this sector such as Intelsat, Inmarsat, Eutelsat, the EC, and for the European Space Agency (ESA). In particular, ESCO recently completed a study for ESA on integrating satellites with the European telecommunications ground network to optimize future satellite use.

During Telespazio's presidency the ESCO consortium will compile a study for phase B of the CONDOR-ASETA program. This concerns the satellite telecommunications system for five countries of the Andean Pact—Colombia, Peru, Venezuela, Bolivia, and Ecuador—and is being financed by the EC. ESCO will also take part in the international bidding for a new plan to create an African regional system (RASCOM).

Underlining a comment made by the company, AIR PRESS reports, this new assignment will allow Telespazio to further develop its experience in the field of systems planning. It will also allow the company to expand the consulting services and technical assistance it supplies, increasing its competitiveness and enabling it to make its own contribution to major national and international space activities in the nineties, such as the Italsat, Olympus DRS, Columbus, and Hermes projects.

Aerospatiale Increases Use of CAD in Airbus Design

36980037a Paris ZERO UN INFORMATIQUE in French 26 Sep 88 p 46

[Article by Anne-Marie Vziat: "Ever More CAD for the Aircraft of the Next-Decade"]

[Text] The use of CAD to manufacture tomorrow's aircraft, in particular the Airbus A340, will considerably shorten production cycles.

Only 10 years ago, Aerospatiale needed 7-8 years to design a new aircraft. Starting with the A320, the latest member of the well-known Airbus family to be set into service, production cycles were reduced to about 4 years. At all production stages, technologies ending in "ics" have helped not only to achieve this reduction in production time, but also to improve aircraft performance characteristics.

With each new project, electronic on-board equipment is refined, new equipment designed, training and maintenance equipment improved. With the introduction on the A320 of a new high-throughput telemetry system supplying real-time results, data processing considerably reduced the aircraft certification time. Increased use of CAD at Aerospatiale led to a considerable reduction of its design cycle.

From 1.5 percent for the first projects, the A300, A310 and A300-600, the share of CAD rose to 33 percent for the ATR, exceeded 80 percent for the A320, and will probably reach 100 percent for the A340, the latest project, launched in June 1987.

CAD, a Tool Rather than an End in Itself

The Aerospatiale engineering and design department, located in Toulouse and controlled by the Aircraft division, has about 1,600 employees and 250 graphics terminals, including 50 workstations. CAD was introduced back in 1975 and, little by little, it got into all stages of the production line: from feasibility studies to manufacturing, product support and quality control. It also affects all partners and subcontractors; such optimum integration is precisely what the company had in mind when it introduced CAD at its Toulouse plant.

Here, however, there is no question of apprehending this technology as a tool to design and manufacture aircraft.

"That," Bernard Vergne, in charge of CAD, indicated, "is because we develop only the tools that are not available on the market." As a result, Aerospatiale did not design many tools; one exception is Aerolis, a software project that can generate and manage complex shapes. "Besides," Bernard Vergne added, "we take only what we think is the best in each specific field." As a result, they are not exclusively bound to one supplier, and they use a wide variety of hardware and tools.

This is how, in 1983, Aerospatiale came to develop the SET (Exchange and Transfer Structure) standard which enables dissimilar CAD systems to exchange all types of data without having to use multiple interfaces. Already in 1983, SET specifications were developed for blueprints, texts, quotations, wire geometry and surfaces; in 1987, there followed 3-D, finite elements and electricity; finally, in 1988, numerical controls, scientific data and technical documentation. Before that, in February 1985, Aerospatiale's partners had decided to use SET to exchange CAD drawings for the Airbus A320 project.

CAD quality will depend not just on the tools used, but also on the database, another strong point of the system according to Aerospatiale. Dating back to 1978, the database runs with SDA, a data structure specific of Aerospatiale and SET, and enables the aircraft manufacturer to set its own procedures and check them when the work is completed, no matter who has completed it. For the A320 and the previous projects, about 40,000 blueprints were entered into the database and they will now be transferred onto IBM hardware; the first A340 blueprints have already been entered.

In addition to a change of hardware, its development, with the introduction of workstations and networks, and the increasing use that is made of the Ethernet network, production of the A340 will experience more extensive changes than that of its predecessor.

Until 1986, CAD used first-generation software; for the A340, it will get into second-generation tools. For this aircraft, the Gilda software (Computerized Management of the Aircraft Division Data Package) will be set into service; it will be used by the entire Aircraft Division to manage all known engineering data: data from the design and engineering department; procurement, production and after-sales control data. Operational since 1988, this software program, which took 4 years to develop, will manage all the drawings to be used in manufacturing the aircraft.

The first A340 drawings were completed last June. The design and engineering department must complete 30 percent of the drawing package of the new project (a four-engine aircraft scheduled to fly for the first time in the spring of 1991) before the end of the year, and 70 percent by the end of 1989.

26th Ariane Satellite Successfully Launched

LD2810104488 Paris Domestic Service in French 0800 GMT 28 Oct 88

[Text] Arianespace managers heaved a sigh of relief at 0317 this morning. On its 26th flight, Ariane left its launch pad at the Kourou Base without difficulty. The European rocket was carrying the first French television broadcasting satellite—TDF-1. Thus for the National Center for Telecommunications Studies and Arianespace, there was no room for mistakes.

Everything went well; TDF-1 is now moving through space before being directed toward its final orbit at an altitude of approximately 36,000 km. In a few weeks the French satellite will supply pictures and sound to 400 million European television viewers. In particular, it will relay the programs of the seventh cultural channel.

According to Minister Delegate for Communications Catherine Tasce, last night's success opens up television to Europe.

Ariane-5 Engineers Aim for 98-Percent Reliability

36980017a Paris L'USINE NOUVELLE in French (special L'ANNEE TECHNOLOGIQUE 1988 issue) Oct 88 pp 38-40

[Article by Marc Chabreuil: "Ariane-5 Aims for 98-Percent Reliability"]

[Text] The future launcher, equipped with a cryogenic motor and two power-propellant boosters, will have to meet security requirements as yet unattained in Europe.

Until 2015 and maybe even beyond that date, all of Europe's ambitions for independence in space will rest on one basic element: the Ariane-5 launcher. The financing of the development program, estimated at Fr24 billion, was approved by ESA [European Space Agency] member countries in November 1987 and was 98.5 percent completed (44.7 percent for France) at the end of February. A few weeks later, the National Center for Space Studies (CNES) signed a Fr1-billion contract with Cryospace (an economic interest group consisting of Aerospatiale, the Ariane-5 industrial architect, and Air Liquide) for the development and manufacturing of the large first-stage cryogenic tanks.

The idea of giving a successor to Ariane-4, the first launching of which took place last June, emerged during the 1970's. Still, the 7 years that remain to complete the development of Ariane-5 will not be too much, as engineers had to completely revise their designs. Actually, Ariane-5 is an entirely new launcher. Considering its design and its size, it was out of the question to extrapolate the results obtained with previous Ariane versions. For instance, the large cryogenic Vulcain motor, the key component of the new program, will provide 10 times as much thrust as the current HM-7 third stage, the development of which proved especially difficult; Vulcain will carry 15 times more propellant in its tanks. And just consider the two large lateral boosters: they will contain 33 times more powder propellant than those of Ariane-4!

The specifications of Ariane-5 were altered several times, in particular to make up for the increased weight of the Hermes spaceplane. Today, technicians aim to launch 21 tons into low earth orbit (exactly the same weight as the Soviet Proton launcher placed into service in... 1965), and 5,800 kg into geostationary transfer orbit (compared with 4,300 kg for Ariane-4). Actually, the originality of Ariane-5 resides essentially in its design: a standard first stage (main cryotechnical stage or EPC) consisting of one large cryogenic motor, the Vulcain motor, between two powder-propellant boosters; and a second-stage adapted to the mission type (Hermes, orbital station components, geostationary satellites, etc.). Under these conditions, it is obvious that the EPC will mobilize most of the technicians' efforts.

The preliminary development stage of the Vulcain motor started in 1984. Since then, the engineers of SEP [European Propulsion Company], the prime contractor for the project (at an estimated cost of Fr5 billion), have been trying to meet stringent specifications: 100 tons of thrust; operation on earth as well as in space, resulting in a performance gap (the thrust will vary from 90 to 104 tons); a service life of 6,000 seconds and 20 starts; and take-off in a highly disturbed atmosphere (the powder-propellant boosters will produce vibrations and heat). Yet, fully equipped, Vulcain will weigh no more than 1,300 kg.

The technical decisions made resulted in relatively conservative characteristics. The principle adopted is identical to that of the current HM-7 motor. To limit contingencies and reduce production costs, Europe gave up the idea of using high-combustion-pressure motors (150- 210 bars instead of 100 bars on Vulcain) like those adopted by the Soviets, the Japanese and the Americans.

Vulcain Cryogenic Motor: A Technological Feat

Remember the problems encountered in the development of Ariane's HM-7 motor: the ignition system was not powerful enough; the turbine pump used to take propellants out of the tanks and inject them into the motor would break down easily and was hard to reproduce at the production stage, etc. All this was child's play compared with the development of Vulcain, which amounts to a technological feat. Nevertheless, the main subsystems will be tested already later this year, and bench testing of the first complete motor is scheduled for 1 October 1990.

Inconceivable without CAD, the liquid-hydrogen turbine pump developed by SEP will run at 34,480 rpm, pumping propellant at the rate of 567 L/s. Although it is only 24 cm in diameter and weighs only 200 kg, it will produce close to 12 MW. Enough to draw two very-high-speed trains! The pump impellers will be made of a titanium alloy; the housings and turbine disks of Inconel 718. More modest (pump and turbine in a single stage instead of 2), the oxygen turbine pump of the Italian Fiat will run at 13,000 rpm and produce 2.9 MW. In both cases, however, the bearings immersed in the propellant will not be lubricated. And starting the assembly in 1 or 2 s will involve considerable mechanical and thermal stresses.

The motor itself is not much simpler, although the technologies used differ little from those used for the HM-7. The cryogenic propellants will be fed to the combustion chamber through an injector consisting of 516 coaxial elements, each with an output of 449 g/s. As the gas temperature will rise to 3,470xC, the combustion chamber (manufactured by the German MBB [Messerschmitt-Boelkow-Blohm] from a blank forging made of a Cu-Ag-Zr alloy) and the nozzle throat will be cooled with hydrogen. The hydrogen will circulate between 2 walls, through 360 lengthwise channels having a rectangular cross-section; the channels will be first countersunk with a numerical-control machine-tool, then reclosed through copper followed by nickel electroforming. The divergent, entrusted to the Swedish company Volvo, will consist of 456 tubes with a square cross-section (4 x 4 mm and 0.48 mm thick), made of Inconel 600 and welded by the TIG [tungsten inert gas] process (in time, this operation should be fully automated). Rolled into tight spirals they, too, will carry hydrogen, which will be exhausted without combustion through 228 peripheral micro-nozzles.

Provided with double thermal insulation (hot and cold), the central cryogenic tank, which will supply Vulcain during 600 s, will contain 130 tons of liquid oxygen and 25 tons of liquid hydrogen separated by a common bottom. The tank will be 5.4 m in diameter and 23 m high; it will be manufactured in a special building, 16,000 m^2 in area, which Cryospace will build at Les Mureaux. The building, a Fr100- million investment, will make it possible to produce 8 tanks per year for 15-20 years. The tanks will consist of panels made of a light aluminum alloy (2219 alloy), machined and welded together; the assembly bench will be 45 m long and 7.8 m high.

After Vulcain is fired and its proper operation checked, it will be the turn of the two powder-propellant boosters made by Europropulsion, an economic interest group consisting of SEP and the Italian Snia-BPD. Each booster will weigh 269 tons and carry 230 tons of solid propellant in the form of a composite powder. The four segments of each booster will be made by the German MAN [Augsburg-Nuernberg Machine Factory] out of a low-alloy (maraging) steel, by flowturning (no welding). Before the propellant is loaded, Snia-BPD will apply to the boosters a heat shield developed by SEP and made of silica-filled EPDM [ethylene propylene diene monomer] plastic. Each booster includes a swivelling nozzle (q6x) mounted on a bearing consisting of a metallic frame and low-modulus natural rubber. The nozzle, which controls the EPC, is actuated by two cylinders powered by two power generators. The convergents, throat inlets and throats of the nozzles will be made of carbon/carbon Sepcarb, with liners made of carbon and phenolic silica. The other areas, such as the divergent, will make do with phenolic carbon. The qualification of these motors, which will produce a 750-ton thrust during 120 s, will occur in 1994. They will be the only recoverable components of Ariane-5: released at an altitude of about 50 km, they will be dropped off Kourou by brake parachutes.

Sobered by four Ariane failures and, above all, shocked by the explosion in flight of the Challenger shuttle, the configuration of which closely resembled that of Ariane-5, European space officials are determined to go the cautious and reliable way. The Vulcain motor, the safety factors of which were calculated very generously (a factor of 4 for the number of ignitions and 10 for the operation period) will be bench tested 550 times instead of 170 for

the HM-7. The powder-propellant motors (scale 1) will be fired 10 times before they are pronounced good for space. As a result, reliability should reach a level never reached yet by a European launcher: 99.46 percent for the Vulcain motor, 99 percent for the first stage, and 98 percent for the launcher as a whole, instead of 90 percent for Ariane-3. The commercial future of Ariane-5 and the life of the three Hermes astronauts will depend on it.

Development of Critical Technologies for Hermes Reported

36980017b Paris L'USINE NOUVELLE in French (special L'ANNEE TECHNOLOGIQUE 1988 issue) Oct 88 p 40

[Article: "Critical Technologies for the Hermes Spaceplane"]

[Text] The European Space Agency [ESA] has given itself until the end of 1990 and a budget of Fr3.7 billion (out of an official total of Fr30.4) to set the configuration of the Hermes spaceplane. Its prudence is warranted by the alterations that have already been made. Initially, Hermes (15 tons) was to carry 4 astronauts and a 5-ton payload on missions of up to 3 months. Its weight has now reached 21 tons; its crew has been reduced to 3; its payload to 3 tons; and its flight time to 8 days. The main cause of this is the addition of an ejectable cabin that could save the crew if Ariane-5 were to malfunction. The cabin can be used only during the first 120 seconds of flight (up to an altitude of 50 km and Mach 7); it is the subject of much criticism from the future astronauts and poses such manufacturing problems that even the Americans and the Soviets have given up the idea. But many other developments [sic] are awaiting Aerospatiale (industrial prime contractor), Marcel Dassault Aircraft-Breguet Aviation ([AMD-BA], the prime contractor in charge of aeronautics) and the many European contractors. They involve essentially:

- Aerothermodynamics: Because the characteristics of the U.S. Shuttle cannot be transposed, because ground simulation and measurement facilities are inadequate, and because physicochemical phenomena are still not well known, Dassault experts will have to develop mathematical models with the help of researchers from 9 countries (68 research contracts; development and use of 19 wind tunnels);
- Heat shields: To withstand temperatures of up to 1,800xC, Aerospatiale offers its carbon/carbon materials and SEP [European Propulsion Company] its silicon-carbide-matrix ceramic composites. Heat-resistant structural components and tiles made of these materials have yielded encouraging results;
- Fuel cells (they must supply 10 kW, last 4,000 hours and have a service life of 26,000 hours; and they must also supply the crew with drinking water): the cell type (hydrogen/air or hydrogen/oxygen) has not been decided yet; none of the cells currently manfuactured in Europe will meet the specifications. Development of the fuel cells will start only in 1989, at Dornier (Germany);
- Remote-controlled arm (to move objects and astronauts around Hermes): entrusted to Fokker (Netherlands), it should weigh only 200 kg (use of carbon fiber/resin) and be 8.5 m long. It will be more complex than that of the U.S. Shuttle: hand-operated control, but also programmed or automated control;
- Thermal control of cabin and equipment temperatures: developed under the responsibility of Aeritalia, it will include a double freon/water closed circuit, expandable radiators made of aluminum honeycomb, single-face or double-face cold plates made of nickel stainless steel, and control electronics that still require much development;
- On-board software: 1 million words—10 times more than for Ariane; its failure rate must be less than 1 in 100 million. The programming language adopted, ADA, will be complemented by the C or LTR-3 languages for some software running in real time;
- The flight compartment: entrusted to Aerospatiale, it will include color liquid-crystal displays with a resolution of 1,000 x 1,000 pixels, synthetic-glass head-up displays (the images will come from liquid-crystal matrices associated to a fluorescent tube), computers associated to each of the on-board displays and connected to the Hermes general buses, etc.

All these technologies (and our list is far from exhaustive) are still at the laboratory stage. Nevertheless, the first unmanned Hermes flight is scheduled for mid-1997, and its first manned flight for April 1998. At the earliest.

Denmark To Participate in Columbus Space Station Project

36980033 Copenhagen BERLINGSKE TIDENDE in Danish 1 Oct 88 p 6

[Article by Jens J. Kjaergaard: "Denmark Providing 300 Million Kroner for Space Station"; first paragraph is BERLINGSKE TIDENDE introduction]

[Text] Ambassador Eigil Jorgensen has signed a cooperative agreement in Washington. It will give Danish industries a chance to get big contracts in such areas as the development of artificial intelligence. This is the biggest cooperative project involving space research to date.

Denmark will pay 300 million kroner to participate in the development and construction of the Columbus civilian manned space station. The money will be paid over a 10-year period. Denmark's ambassador to the United States, Eigil Jorgensen, has signed a government agreement to participate in the project. Its successful implementation depends on the space shuttle's operating safety and its ability to live up to expectations.

In return, Danish industries can expect to get contracts from the high-tech project, which could include software development for what are popularly referred to as computers with artificial intelligence.

Danish researchers will be able to produce entirely new alloys in the weightless environment and they will also have an opportunity to participate in trailblazing medical and biological experiments. The National Hospital is already building a simulator where Danish astronauts and space technicians can practice operating the equipment.

Denmark will participate in the project within the framework of ESA, the European Space Agency, which is a counterpart to the American NASA.

At this time ESA has a Danish council chairman, section chief Henrik Grage of the Research Directorate.

Under the agreement Denmark will pay 1 percent of the cost of constructing and launching Columbus, he told BERLINGSKE TIDENDE.

Briefly, Columbus includes a laboratory bolted to the core of the space station, which is being supplied by the United States. In addition there will be a free-floating unmanned structure flying in tandem with the station—and a platform in orbit over the Poles.

U.S. Secretary of State George Schultz signed the agreement on behalf of the United States. It is the biggest cooperative space research project to date. Canada, Japan and nine European countries are involved in the project.

FGR Government, Industry Negotiate MBB Takeover

Text of Cabinet Proposal

36980068 Bonn DIE WELT in German 3 Nov 88 p 14

[Text of cabinet proposal for the restructuring of the German aviation industry: "In the Cabinet: The New Structure for Airbus"; first paragraph is DIE WELT introduction]

[Text] The reorganization of the German aerospace industry is about to happen. No subject arouses the public more than the planned investment by Daimler-Benz AG, Germany's largest industrial enterprise, in Messerschmitt-Boelkow-Blohm GmbH (MBB). This is intended to ensure the future of Airbus, the joint European project. Yesterday, Minister for Economics Bangemann presented his confidential proposal to the chancellor and the rest of the cabinet shortly before the cabinet session in Bonn. DIE WELT presents a verbatim text of the body of the cabinet proposal.

Cabinet Proposal for the Restructuring of the German Aviation Industry (Investment by Daimler-Benz AG in MBB/Airbus)

Draft Resolution

It is a goal of the federal government to make the Airbus program fully autonomous within the private sector. Through the present plan, it is intended that responsibility for the Airbus program gradually be shifted to the private sector, and that in particular the necessary improvement in the cost structure in aircraft development and production be achieved. In order to make this possible, the federal government is willing to reach a new settlement on the Airbus program's old debts, to cover part of the foreign-exchange risk for a limited period of time and to assume, as an interim measure leading up to the full private-sector solution no later than in 1999, a 20 percent investment in the new MBB subsidiary for civil aircraft construction through the Reconstruction Loan Corporation [KFW].

In particular, the federal government adopts the following resolutions:

1. The attached "target data" for a Daimler-Benz/MBB solution are approved.

2. The federal government will undertake the budgetary measures for the fiscal years beginning with 1989. It will be responsible for authorizing a commitment to cover any charges from the years 1989-2000 amounting to DM 4 billion. Repayment of the development cost subsidies for the A310 improvement program and the A320 program can be employed, depending on earnings, to offset the foreign-exchange settlement (old debt settlement and foreign-exchange guarantee). The loan for serial production of the A320 program can—if necessary—be converted into equity capital for the MBB subsidiary for civil aircraft construction; repayment of the remaining principal and interest payments can be settled on the basis of returns.

3. The federal government emphatically supports a comprehensive reorganization of the Airbus system on a European scale.

Goal of the Restructuring and Status of Talks

With the planned investment by Daimler-Benz AG in MBB and the resulting possibility of restructuring German Airbus activities, there is now a realistic chance that the Airbus program can be made fully autonomous within the private sector in the long run and that the public funding for Airbus can be recovered. This opportunity to strengthen the efficiency of the German aerospace industry is justification enough for further, considerable financial efforts to open up this prospect for the Airbus program.

In the cabinet decision of 3 June 1987, the federal government had already agreed to discharge around DM 1.9 billion in old debts by the Airbus program, and thus at the same time to give German Airbus partner MBB the potential to raise new capital stock in order to be better prepared to cover Airbus risks. Since then, however, the change in the foreign-exchange situation has resulted in further debts or the prospect of further debts.

The planned investment by Daimler-Benz AG in MBB creates the precondition for a private-sector majority in the Airbus program, and should have a positive effect on the efficiency of the German aerospace industry. In addition, the restructuring should facilitate the successful reorganization of the European Airbus Industrie and of German involvement in the European aviation industry.

The federal minister for Economics has held talks with companies under consideration with respect to increasing the capital stock of MBB. The only remaining interested party is Daimler-Benz AG. The "target data" (Appendix 1) indicate the position that the federal government has adopted in negotiations with Daimler-Benz AG.

In accordance with the status of talks thus far, it can be assumed that an agreement with Daimler-Benz AG is possible. Furthermore, it can be expected that Daimler-Benz AG will successfully conclude talks with the MBB stockholders concerning the terms and conditions of the investment (for example, extent of increase in capital, appraisal of the company). The Laender who are stockholders in MBB have already indicated to the federal minister for Economics that they are willing to support the plan.

The offer by the federal government must be specified now since a commitment of DM 4 billion must be authorized in the 1989 budget.

Nevertheless, even after an agreement on the basis of the target data, there remain risks for Airbus, since the long-term development of the exchange rate of the U.S. dollar cannot be predicted. The competitive position against the dominant U.S. manufacturers will remain difficult. In order to limit these risks, the federal government should emphatically urge a radical reform at Airbus Industrie as well as more efforts to pursue cooperation with McDonnell Douglas.

Role Expected of Industry

Within the framework of the plan, MBB/Daimler-Benz have accepted that the new MBB subsidiary for civil aircraft construction will be set up in such a way that it can assume full responsibility for all future entrepreneurial and business-related risks. Exceptions to this—for a limited period of time—are foreign-exchange risks, which the federal government is willing to partially cover within the context of a system involving absorption of foreign-exchange earnings.

The federal government establishes the condition that the subsidiary must be adequately provided with additional equity capital by the private sector, which means at least DM 1.2 billion as valued at the end of 1994. In particular, the resources gained by MBB from the increase in capital must be diverted to the subsidiary. In addition, the existing equity capital of Deutsche Airbus GmbH, amounting to DM 450 million, must be invested in the new subsidiary.

Budgetary Effects on the Federal Government

The extent of budgetary strain on the federal government depends on future foreign-exchange developments, which affect both the recovery of old debts and the foreign-exchange guarantee. In the event of an average exchange rate of DM 1.60/dollar, the federal government, based on current assumptions concerning price and quantity of aircraft to be delivered, must count on budgetary funding of up to DM 2.6 billion for charges from 1988 to 1996 from the old debt settlement and up to DM 1.7 billion for charges from 1992 to 2000 from the foreign-exchange guarantee. These amounts would raise the current total pledge of DM 10.7 billion (Appendix 2) accordingly; in addition, there could be a residual of guaranteed credits totalling no more than DM 1 billion at the end of 1994.

Above a rate of DM 2.00/dollar for the A300/310/320 programs and DM 1.80/dollar for the A330/340, the additional charges would no longer apply. Instead, the federal government would absorb foreign-exchange earnings up to the level its investments.

Added to this are revenue waivers by the federal government on repayable development cost subsidies that have already been paid out and that are included in the above DM 10.7 billion figure.

In view of these high costs for the federal government, there does not appear to any more latitude for further concessions by the federal government during the concluding talks, insofar as effects on the budget are concerned. The role for the federal government provided for now is feasible if the sought progress in privatization is achieved.

Involvement of the KFW

The involvement of the federal government in the subsidiary, by way of the KFW, shall be limited to 20 percent, whereby the total public investment (federal government and Laender) must be less than 50 percent. KFW involvement is unavoidable as an interim step towards the full private-sector solution. Repurchase by MBB/Daimler-Benz should take place no later than the end of 1999.

Target Data for a Daimler-Benz/MBB Solution

Involvement of Daimler-Benz

The existing stockholders in MBB will allow the entry of Daimler-Benz, with a 30 percent share, through an increase in capital. Daimler-Benz receives an option to assume controlling interest of 51 percent.

MBB-UT will be separated as a subsidiary of MBB and will be structured as a legally independent corporate enterprise ("subsidiary"). The recalculated share of the Laender in the subsidiary combined with that of the KFW (No 5) will be less than 50 percent. MBB and the subsidiary will be joined in terms of earnings no later than the point at which the KFW interest is assumed by MBB/Daimler-Benz.

The sale of MBB stock to the "subsidiary" requires the prior consent of the federal government.

The reciprocal work load between MBB and the "subsidiary" in terms of civil and military production and development will be arranged in such a way that the "subsidiary," like MBB-UT at present, receives employment and positive profit contributions from military production. Corresponding arrangements are being made for the space sector.

Capitalization of the "Subsidiary"

MBB (including the new partner Daimler-Benz) ensures through corporate decisions that the "subsidiary" has adequate equity capital for the volume of business expected per 1994. This means at least DM 1.2 billion in new equity capital from MBB/Daimler-Benz (value as of 31 December 1994) plus the already planned increase in capital by another DM 150 million to DM 450 million. For this equity capitalization, it is particularly important that the resources expected from the increase in capital at MBB be diverted to the "subsidiary."

In order to back up the anticipated KFW investment with capital, the A320 loan is converted to equity capital equivalent to the investment share (No 5). Moreover, at least the reserves earmarked for MBB-UT in the MBB balance sheet shall be transferred to the "subsidiary." Similarly, MBB shall transfer all claims from development cost subsidies already paid out to the subsidiary.

The channeling of equity capital and reserves must ensure that the "subsidiary" is able to bear the charges from the serial financing of the A330/340 program, in addition to financing of the current programs. In addition, it must bear the charges from any deficits with regard to the cost reduction of DM 557 million provided by the federal government. The "subsidiary" must assume a 25 percent investment in producer guarantees issued by Airbus Industrie. The fee for the share to be borne by the federal government amounts in principle to one percent annually on the total outstanding obligation (exceptions apply for standby periods and old debts).

On the Assumption of Airbus Old Debts by the Federal Government Beyond the Cabinet Resolution of 3 June 1987

The federal government is willing to make a further contribution to settling Airbus old debts resulting from the decline of the dollar in the old A300/A310 and A320 programs. The 1986 schedule submitted by Deutsche Airbus GmbH, which was the basis for the first old-debt assistance measure by the cabinet on 3 June 1987, assumed a long-term average exchange rate of DM 2.00/dollar for the existing programs. Within the framework of a revaluation of the "A300/310 old program" for the deliveries planned through the end of 1996 as well as the "old orders" and "old options" on the A320, the federal government is willing to offset old Airbus debts as far as an exchange rate of DM 1.60/dollar through:

— conditional release from repayments of the development cost subsidies from the A310 improvement program and the A320 program,
— providing funding and effecting authorization for a commitment for 1990 to 1997 in the 1989 federal budget, totalling up to DM 2.6 billion.

The funds will be paid out each year depending on actual foreign- exchange developments during the previous year. Foreign-exchange earnings from foreign-exchange rates higher than limit established in the revaluation are absorbed up to the level of assistance provided by the federal government from 1989 to 1997 for the above-noted foreign- exchange losses.

The amount offset or absorbed is adjusted if and when the pertinent cost indicators of the aviation industry in the United States deviate from the assumptions contained in the alternative assessment of the 1987 schedule. In the event of an effective dollar exchange rate within the limits, statistical surplus proceeds caused by a greater escalation of costs in the United States than supposed in the alternative assessment of the 1987 schedule are downwardly offset. The statistical determination of escalation shall be based on Form 2, which is standard in the international aviation industry.

Time Limitations on the Guarantee of Future Foreign-Exchange Risks

The old debt arrangement, which releases the current Airbus program from foreign-exchange risks within certain limits, cannot be transferred to future foreign-exchange risks and new programs. In principle the foreign-exchange risk for future production must be assumed by the private sector.

Because of overriding considerations, however, the federal government is willing, as an exception and to a limited extent, to assume a foreign- exchange guarantee for future exchange risks.

Beyond the old debt settlement in accordance with No 5, the federal government will offset up to 75 percent of annual losses of the "subsidiary" until 1998, and up to 50 percent after that, as long as these are the result or will be the result of a shortfall in receipts from Airbus sales where the foreign-exchange rate is below DM 2.00/dollar for the A300/310/320 programs and DM 1.80/dollar for the A330/340 but above DM 1.60/dollar. The foreign-exchange limits shall be established in keeping with No 3. The limit on the foreign-exchange guarantee is the year 2000. From 1992 to 2000, budgetary funding of up to DM 1.7 billion will be set aside for this. In addition, as with No 3, conditional release from the development cost subsidies for the A320 is planned.

As with No 3, negative developments in the pertinent cost indicators are taken into account. Foreign-exchange earnings from exchange rates above the limits established in the revaluation are absorbed up to the level of payments made by the federal government for foreign-exchange losses.

Involvement of KFW in the "Subsidiary"

The federal government is willing to accept a 20 percent interest in the "subsidiary" by way of the KFW; the KFW will exert corresponding influence on the business affairs of the "subsidiary." This interest is acquired through conversion of part of the federal government's loan for the A320 program into equity capital. MBB-/Daimler-Benz are obligated to assume the KFW interest by no later than the end of 1999.

Deferral of Federal Government Repayment Claims

The repayment and interest claims of the federal government from the current Airbus program are, with the exception of claims from foreign-exchange settlements as in No 3 and 4, settled dependent on earnings wherever necessary.

Beginning in 1997, the federal government shall defer repayment claims dependent on earnings insofar as this is necessary in order to adequately pay interest on all equity capital of the "subsidiary" beyond the equity of Deutsche Airbus GmbH amounting to DM 450 million. This does not apply to the repayment claims from the foreign-exchange guarantee in No 4. The interest applied is the calculated interest rate for public contracts.

Treatment of the Residual Collateral

The federal government will discharge the remaining credits in 1994 that are pledged according to current plans for the A300/310 programs, totalling approximately DM one billion if they have not been redeemed by unexpectedly positive revenue developments in the A300/310/320 programs by then.

In keeping with the counterguarantee, MBB will pay 25 percent.

New Programs

The federal government is willing to support the development of new Airbus projects after studying and confirming their feasibility within the framework of the financial potential of the federal government.

Incorporation of Deutsche Airbus GmbH

The "subsidiary" and Deutsche Airbus GmbH shall be consolidated effective 1 January 1989.

This proposal is subject to the establishment of budgetary preconditions.

Interview With MBB Head

36980068 Munich SUEDDEUTSCHE ZEITUNG in German 29-30 Oct 88 p 35

[Interview with MBB board chairman Hanns Arnt Vogels, by Volker Woerl: "Airbus Should Be Covering Its Own Costs in 3 Years: But the Dollar Risk Will Still Have to Be Borne: Cabinet Decision Expected Soon"]

[Text] Munich, 28 Oct—The European Airbus program will be able to cover its own costs in around 3 years—except for risks resulting from the exchange rate of the dollar. These risks must continue to receive flank support from the public treasury. The cabinet is generally expected to deal with these guarantees and assistance measures, which are a precondition for the planned involvement by Daimler-Benz AG, Stuttgart, in Messerschmitt-Boelkow-Blohm GmbH (MBB), Ottobrunn, on 2 November. These expectations were expressed by the chairman of the board of MBB, Hanns Arnt Vogels, in an interview with SUEDDEUTSCHE ZEITUNG.

Vogels emphasized that he welcomes this investment, since under the given conditions no other interested parties came forward. For example, he said, Siemens never showed any interest; that company is apparently satisfied with its nine percent investment. Vogels admitted that Bayerische Motoren Werke [BMW] showed interest a couple of years ago, but under the condition of receiving a clear majority and thus a clear private-sector leadership role. No agreement was reached, especially in conjunction with talks with the Bavarian Land government, Vogels said.

Daimler-Benz at the Front Door

According to the MBB head, Daimler-Benz's involvement will initially be 30 percent, and will be achieved by an increase in capital, from which the present stockholders are voluntarily excluding themselves. This will be linked to an option on at least 51 percent of the capital at a later date. In this regard, Vogels was unwilling to use

the term "industrial leadership." He spoke of an industrial involvement, but this meant not only a financial commitment. Daimler, he said, is clearly interested in participating in the restructuring of the European aerospace industry—with or without MBB.

Vogels stressed that the financial guarantees for the Airbus program are a matter of life and death for MBB. Left to its own devices, the company would not be able to go on with this program, which the federal government wants to see continued. Thus, Vogels said, the federal government is continuing to shoulder responsibility. However, Bonn wants to shift the financial risk to the private sector as soon as possible. Vogels noted that the Bundestag Budget Committee is expected to work on the necessary budgetary changes for guaranteeing the Airbus program on 9 November.

When asked why Daimler was needed if the federal government was assuming a great deal of the Airbus risk anyway, the MBB head said that Bonn regards Daimler involvement as critical to the capitalization of the new Airbus company. This company must gain a good credit rating on the market in order to be able to receive further financing from credit institutions through the year 2000.

An AG for Airbus

According to Stuttgart projections, this new Airbus company will be a joint stock company [AG], with MBB holding an 80 percent share and the government-controlled Reconstruction Loan Corporation holding 20 percent. The latter holdings are to be turned over to Daimler or MBB later on. Before establishing the new company, the MBB Transport and Civil Aircraft Group is to be incorporated into Deutsche Airbus GmbH, whereby the latter will cease to exist as a company.

Vogels was unwilling to provide details on personnel questions, but did say that he expects for himself a leading role in the restructured aerospace company. It could be assumed, he said, that he will remain chairman of the board of MBB.

In Vogels' view, there will be no locational guarantees for the various MBB plants under a new structure, nor are such guarantees necessary. The Hamburg site is uncontested, as long as there is an Airbus program. He also perceives no Airbus risks for Bremen, and the space activities will also stay there. In all of this, Vogels said, one must basically keep in mind that the monthly rate of production increased from three airplanes a year ago to eight today, and that it will continue climbing to 14-18 over the next few years. However, he conceded, this includes a large percentage of the A320, which is not as labor-intensive as the A300 and A310.

Should new capacity be required in this regard, the better utilization factor of the south will take precedence over the north, he said. At present, 70 percent of the Airbus is centered in the north, compared to only 30 percent in southern German plants. Vogels noted in this regard the plants in Augsburg, Donauwoerth and Speyer. When asked whether the smaller MBB plants will still be safe after Daimler-Benz invests, Vogels said, "As I see it, yes." However, he conceded that it is not possible to give any perpetual guarantees for certain sites that have nothing to do with Airbus or with major military programs. Moreover, he noted the growth in company personnel, which now has more than 40,000 employees, including the nearly 2,000 trainees.

Vogels believes that the restructuring of Airbus Industrie, in part through the appointment of a future finance director, will also help clear up cost issues with supplier companies, which would mean an improvement in the overall cost structure. This is important, he said, with a view to 1992, in which a European company could emerge in a common internal market.

In Vogels' words, it would be premature to see in him a successor to the late Bavarian Minister President Franz Josef Strauss in the role of chairman of the board of directors of the European Airbus consortium. "The French have expressed their approval, they would support it fully," he said. However, a decision is not expected until 17 November in London.

Jaeger 90 Advocate

Vogels is adamant in his support for the Jaeger 90 program. After the chancellor's visit to Moscow, in which he participated as a member of the economic delegation, he noted the Soviet superiority in conventional arms. "In the MIG 29, the Russians have a very modern fighter, and all of us who experienced the Second World War know what it means to lose sovereignty over one's own airspace." This sovereignty cannot be achieved with surface-to-air missiles, he said. Furthermore, even the missile people at MBB have reportedly figured out that a continuous defense screen relying exclusively on ground-based missiles is more expensive than a combination of surface-to-air missiles and fighter aircraft.

The MBB head emphasizes that his company has made a great deal of progress in civil activities. Including aerospace operations, the civil share this year is 54 percent, leaving only 46 percent for the military, he said. Turnover in civilian industrial goods outside aviation is DM 270 to 280 million, he noted, and clearly over DM 400 million if one includes steel rail technology. To the extent that there have been losses in civil projects, these have resulted primarily from "old activities" dating way back, including the steel rail business, Vogels said. He noted that MBB has invested a considerable amount in the areas of wind energy and photovoltaic technology. The latter cannot possibly be profitable before the turn of the century, he said, "because it is a purely future-oriented development." Vogels also mentioned the development of civilian sensors and work on the airbag

safety system for the automobile industry, and said that one simply had to rid oneself of the psychosis that the new civil activities at MBB have been a particularly troublesome area.

Soviet Interest

With regard to his visit to Moscow, Vogels reported on extensive talks with, among others, the Soviet minister of Railways on the subject of maglev technology. This mainly involved two projects, Vogels said: a link between the primarily tourist-oriented airport in Crimea to the recreation centers on the sea, and a new belt line around Moscow. In both cases, Vogels said, the use of maglev vehicles is being seriously considered. For the Crimean project, investments by private financiers are possible; for example, the major German tourism companies could be interested in it, he said. Vogels wants to discuss this matter with the head of the TUI tourism agency. He also reported that German-Soviet working groups will soon be starting up their activities. This involves cooperation in the construction of drive units, in aircraft, in space and in modern materials.

The head of MBB expects company sales this year to be around DM 7.1 billion, with a better profit-and-loss statement than last year.

Interview with Cartel Office President

36980068 Hamburg DER SPIEGEL in German
14 Nov 88 pp 122-123, 126

[Interview with Cartel Office President Wolfgang Kartte: "'This Case Is a Whopper': SPIEGEL Interview With Cartel Office President Wolfgang Kartte on Big Mergers and the Daimler/MBB Case"]

[Text]

SPIEGEL: Mr Kartte, what is really keeping you in your position?

Kartte: I love my work, and I also believe that as president of the Cartel Office I am in the right place.

SPIEGEL: The biggest German merger, the planned consolidation of Daimler-Benz and MBB, has completely bypassed your office thus far. If the important decisions are being made in Bonn, what then is the purpose of you and your Office?

Kartte: You will hear nothing from me about the Office's position on the planned Daimler-Benz/MBB merger. We are required by law to examine the case as soon as it is submitted to us. We then have 4 months. I'll be damned if I'm going to waste my shot at the very outset.

SPIEGEL: The case offers enough ammunition to quickly write out an injunction.

Kartte: In such an explosive case, we cannot shoot from the hip. When you're talking about a newspaper or the purchase of a wheat mill, then there's only one market involved. With Daimler/MBB, it is an entire spectrum, from trucks to howitzers.

SPIEGEL: With the addition of MBB, Daimler-Benz will control more than half of the German armaments industry. Is this alone not reason enough to reject the merger?

Kartte: We must first clarify some critical questions, such as: Are we looking at European markets or world markets? Are they open to other competitors? If so, then even large shares of the domestic market play a small role.

SPIEGEL: Surely you will not contest the fact that this matter is a problem due to the mere size of it?

Kartte: As we say in Berlin, "This case is a whopper." It is the biggest merger, the biggest concentration of economic power that we have ever been presented with. However, we cannot be interested in the sheer size of it. We must first examine whether monopolistic power exists or is being strengthened in Daimler's and MBB's areas of activity.

SPIEGEL: Have you or the relevant department been asked for your opinion on this matter by one of the parties involved?

Kartte: The companies have not yet contacted us.

SPIEGEL: When Daimler-Benz wanted to move in on AEG, the electronics company, 3 years ago, they first came to Berlin to ask about the possibilities.

Kartte: In all important cases, the companies have come to us before submitting a formal application. We call this an informal process. That was also the case in the Daimler/AEG matter.

SPIEGEL: In the Daimler/MBB case, the executives are perhaps assuming that they cannot count on approval.

Kartte: I don't know what Mr Reuter and Mr Vogels are assuming.

SPIEGEL: Apparently, the companies have already been promised that Bonn will ignore a veto by the Cartel Office, and that is why they have not come to you.

Kartte: I am not interested in examining motives. After all, the entire case did not really get under way until last week's cabinet resolution. Perhaps the people in question will still pay us a courtesy call before the formal process begins.

SPIEGEL: In the event that you reach a negative judgment, then what State Secretary for Economics Riedl has already described will take place: The minister will steamroller your veto.

Kartte: The minister's authority to override a veto presupposes very careful deliberation. This authority may only be granted if the scope of the restraint of trade does not jeopardize the free enterprise system. We have had very few cases of this in the past. In 15 years of merger control, ministerial authority has been granted only five times.

SPIEGEL: Do you expect that Bangemann's successor, Helmut Haussmann, who 10 years ago as an FDP expert on competition wanted to impede this ministerial authority, is perhaps thinking about his previous views, even after Riedl's announcement?

Kartte: No expectations, no hopes, no emotions. However, I have not yet lost my optimism.

SPIEGEL: The Daimler case touches on the very essence of the often sworn-upon free enterprise system. Does Bonn's industrial policy not represent a different course towards an entirely new system, an economy very much characterized by supercompanies, with the state's collaboration?

Kartte: Indeed, we have for some time noted an increasing tendency by the state to intervene in the market. This can be justified by the process of worldwide economic integration. Nevertheless, I am concerned that we will arrive at a sort of two-class system in terms of competition. One class consists of companies in the key sectors...

SPIEGEL: You mean coal, steel, shipyards...

Kartte: Not only the classical sectors. These days, an industrial policy is even needed for the automobile industry, we even have similar ideas for the atomic industry, for electronics, aerospace. That is one class. The state looks after these key industries. The other class consists of regular companies: the textile industry, leather goods, all the medium-sized and small businesses. These companies are subject to normal competition—in this country, in Europe and worldwide.

SPIEGEL: How much competition is there left in the German national economy anyway?

Kartte: That cannot be quantified precisely. But there are scientific calculations that indicate that clearly less than 50 percent of the net value created in the FRG is still subject to full competition, and that the other 50 percent is done with or without limited competition. In the sectors in which the state is involved, many people talk about a breakdown in the market. But I believe that one should call it a breakdown of politics instead.

SPIEGEL: In your opinion, the economy would be better off without the intervention of politicians?

Kartte: State intervention costs money and discourages those who are not feeding from the subsidy troughs. I object to the emergence of giant entities that for all intents and purposes no longer bear the risk of bankruptcy under free enterprise. It is practically impossible for the state to allow a company with 100,000, 200,000, 300,000 employees to go bankrupt.

SPIEGEL: And the losses are borne by the general public.

Kartte: The losses are socialized.

SPIEGEL: If the state supports the formation of these large companies with a great deal of money, then it will also expect a major return from it.

Kartte: God knows that it has happened in the rarest of cases that the biggest companies have been the most successful ones. If the state cultivates these champions, gives them subsidies and perhaps even protection from imports, then competition is corrupted. But there is also a second, sociopolitical point that is not addressed by the Cartel Act. If entire regions are dependent on the investment decisions of these giant companies, then this could be dangerous. Economic policy is then in the hands of these companies.

SPIEGEL: Meaning that economic power is converted into political power.

Kartte: After all, free enterprise in part means a decentralization of power. If I provide for diversity, then at the same time I have also splintered power. However, the Cartel Office is not responsible for this sociopolitical aspect. That is the parliament's job.

SPIEGEL: If, according to your two-class theory, there is scarcely any remaining competition in broad sectors of the economy, if the state is spending a great deal of money on forming huge companies that are gaining political power as well—is this not already a new economic system?

Kartte: We have long since crossed the Rubicon between the free market economy of Ludwig Erhard and an industrial society influenced by group interests. Today, we live in a mixed economic system. There was economic power back then as well, but it is becoming more and more concentrated on increasingly fewer actors.

SPIEGEL: Will this trend not grow stronger as Europe continues to coalesce economically?

Kartte: I do see the danger of an unholy alliance between industrial politicians and European big business. Still, I would have few worries about competition in Europe if we could be certain that the external borders will remain

open. But when I see, as in Italy, France and England, for example, how automobile imports are restricted, and when I then try to imagine a joint trade policy, it sends chills up and down my spine.

SPIEGEL: The vision of Europe's open borders has given the advocates of mergers at least one new argument: If companies like Daimler and MBB unite into one mammoth company, then it is still not that big in the total European context.

Kartte: One thing is for sure: Large companies in small national markets have become small companies on the large European market. To a certain extent it is natural that companies that have thus become smaller are attempting to become bigger again on the European scale, or even on the world scale.

SPIEGEL: And the state should help them in this?

Kartte: No, not at all. That decision should be left up to the companies. Politics should stay out of it. After all, the government does not bear any market risk and ultimately bleeds the taxpayer.

SPIEGEL: As with Airbus?

Kartte: There is nothing wrong with subsidies for fundamental research, the results of which are open to all. But today, the state is favoring certain projects by large companies and in some cases even assuming these companies' development costs.

SPIEGEL: What would you say if a company let a planned merger fall through simply because it did not receive any subsidies?

Kartte: Just let it be. A merger is only sensible if it strengthens the efficiency of the company. If it needs a subsidy as incentive, then there can't be much of an increase in efficiency.

SPIEGEL: Daimler-Benz executive Heinz Duerr has called for a coordinated industrial policy, like the one pursued in Japan by MITI, an authority that transcends business sectors.

Kartte: Heinz Duerr used to be one of our exemplary small businessmen. By expanding his father's business into a flourishing worldwide engineering company, he was a big success as a solitary fighter.

SPIEGEL: Now he is on the board of directors of Germany's biggest company. Do different rules apply to men like him?

Kartte: I have the impression that corporate executives sometimes want more than to plan their investments and business. They are involved in economic policy. To a certain extent, it is symptomatic that men like Edzard Reuter or Alfred Herrhausen of Deutsche Bank are increasingly dominating the public debate on the economic system.

SPIEGEL: When Daimler swallowed up AEG 3 years ago, you predicted a lively debate on the nature of the system.

Kartte: I was wrong there. Nothing happened in parliament. This debate is going on right now among the public. The encouraging thing about it is that it shows how alive free enterprise and competition still are in our country.

SPIEGEL: And the irritating thing about it is that the debate on the Daimler/MBB matter did not begin until everything had already been decided.

Kartte: Kartte has nothing to say about that.

SPIEGEL: Because Kartte feels passed over?

Kartte: I won't be discouraged. We in the Cartel Office plan to keep at it.

FRG's MTU, MBB Study Engines for Hypersonic Flight

36980021b Stuttgart FLUG REVUE in German Sep 88 pp 68-70

[Article by Helga L. Hillebrand: "Engine Technology: Designs for Hypersonic Aircraft"]

[Excerpts] Within the German Saenger engine program, which is subsidized by the Federal Ministry for Research & Technology, MTU is heading up the consortium and is also responsible for the turbo segment with the high-temperature fan, the nozzle, and the cooling-air cooler with hydrogen. Messerschmitt-Boelkow-Blohm is working on the ram combustion chamber, the intake and the hydrogen heater. Both partners are working on possible materials and configurations. Both areas are technologically expensive. The intake must be suitable for high temperatures and adaptable to a wide spectrum of uses. Hydraulic adjustment is needed in order to adapt it to the various phases of flight. At mach seven, the temperature in the ram combustion chamber rises to around 3000 degrees Kelvin, or around 2750 degrees Celsius. Active cooling is absolutely essential here, because present-day materials are unable to sustain such heat. Also needed are ingenious methods for achieving stabile combustion. The nozzle must not only sustain high gas discharge temperatures, but also be adjustable across a wide range.

MTU's task is no less difficult. Work there is under way on a fan engine with a variable cycle and adjustable blades. Thus, in ramjet operation, the blades would be

turned in the direction of flow, so that the air passes through the fan engine undisturbed. In addition, the fan must sustain high temperatures.

Technology Phase Has Just Begun

All six designs are being studied parallel to one another, even though each of the two companies quietly has its own favorites. During the coming year, an agreement will then be reached on two principles that will then be studied further. The project is divided into two phases. The pure study phase runs to 1990 and primarily involves theory development. The second phase—the technology phase—is set to run to 1992, and will involve hardware development and component testing. It was initiated on 14 July after the BMFT [Federal Ministry for Research & Technology] expressed its consent. As early as this year, MBB wants to have a ram engine 25 centimeters in diameter (which corresponds to a scale of around 1:4 or 1:5 to the original) on the test bench. In the meantime, MTU is concentrating on the temperature-resistant fan blades.

The partners agree that this type of engine cannot be developed without adequate component tests and a flying demonstrator. It is for this reason that the MBB test bench in Ottobrunn is currently being expanded. Previously, it only went up to mach four, and had an air flow rate of 120 kg/s limited to one minute. This is not enough. In order to achieve realistic conditions, the air must be preheated through precombustion with liquid hydrogen. However, this results in the formation of water vapor, which in turn inhibits measurement. This problem could be solved by feeding the air through a steel vessel filled with tungsten pellets or highly heat-resistant material. The hot pellets heat the air, and only then is it further heated by hydrogen. Funding has yet to be approved for this design step.

With this technology program, Germany hopes to create a good foundation for later European cooperation. Financial support is at any rate very good by European standards—especially now that the British government has refused to further subsidize the Hotol project.

Agusta Signs Contract in Manila to Supply Aircraft, Technology

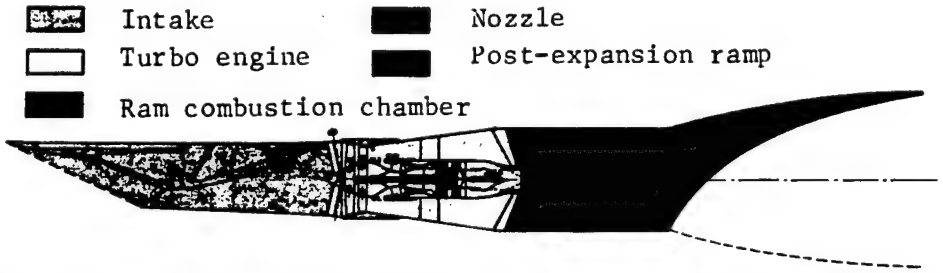
3698m537 Rome AIR PRESS in Italian
8 Sep 88 p 1611

[Text] (AIR PRESS)—The Agusta group has signed a contract in Manila for more than 100 billion lire to supply 18 S-211 training aircraft to the Philippine Air Force. The contract also includes an option for an additional 18 airplanes. The airplanes will be delivered within two years and final assembly will take place at the state-owned Philippines Aerospace Development Corporation.

An Agusta press release adds that the contract is part of a wide-ranging agreement for industrial collaboration between the Agusta Group and the Philippine company. It also foresees the transfer of new technology which will encourage the creation of new production capacity and new skilled job openings in the short term. Under the contract the Philippines Aerospace Development Corporation will also become an important service center for numerous Agusta products in Southeast Asia.

Industrial collaboration initiated with the S-211 trainer sale will extend to other Agusta Group aircraft, including the SF-260, the primary trainer sold worldwide, which has been part of the Philippine Air Force's equipment for some time now, and the SF-600 "Kangaroo," a multi-use twin-engined plane with high wings capable of takeoff and landing on short, semifinished landing strips. The "Kangaroo" will demonstrate its great versatility in Southeast Asia, whether as a cargo or a passenger plane.

The press release concludes with the statement that the agreement reached with Manila is particularly important at both the industrial and the commercial level, and confirms the Italian group's commitment to increasingly extend and qualify its presence in Southeast Asia; this



This combination propulsion unit with ramjet and turbofan engine is one of six designs currently being studied by the MTU/MBB consortium. The front area is the common intake. It is opened or closed further using hydraulic actuators. The fan engine, with variable cycle and adjustable blades, is positioned underneath the intake. During ramjet operation, the fan blades are turned to the direction of flow, thus permitting the air to pass through uninterrupted. The combustion chamber of the ramjet is depicted next to the fan engine. The nozzle is also adjustable and discharges into a large expansion ramp.

market is showing great appreciation for all Agusta products. The S-211 in particular, is already used in Singapore where 30 airplanes are part of the air force. The S-211 training jet has an advanced concept that combines sophisticated technology with great economy in cost. The Philippine Air Force has decided that this aircraft best responds to their specific training requirements and made this choice after an in-depth evaluation of all competing aircraft over a two year period.

Aeritalia Subsidiary Established in Turkey

3698m008 Rome AIR PRESS in Italian
8 Sep 88 p 1612

[Text] Industrie Aerospaziali Mediterranee is the new Aeritalia subsidiary established in Turkey a few days ago in compliance with Turkish regulations. A company press release received by AIR PRESS reports that Aeritalia made this decision in view of prospects for development in that market. Indeed, within the framework of Italian-Turkish industrial cooperation, the newly established company will also provide an adequate on-site support structure should the G-222's be included in the Turkish transport aircraft acquisition program, as hoped. The program is currently being studied by the appropriate government agencies. Cooperation between the two countries was further consolidated by recent talks held in Turkey by Italian Undersecretary for Defense Giuseppe Pisanu and General Luigi Stefani, the Secretary for Defense, with their Turkish counterparts.

Future Activities of Fokker Described

Fokker Not Interested in Share of Concorde Follow-On

36980004a Rotterdam NRC HANDELSBLAD in Dutch
7 Sep 88 p 15

[Article: "Fokker: No Interest in Designing New Concorde; Just Interested in Airplane Technology Studies"]

[Text] Rotterdam, 7 September—The Dutch airplane manufacturer, Fokker, is not interested in developing a successor for the Concorde, the prestigious supersonic airplane used by Air France and British Airways. Fokker would like to be involved, however, in combined research projects of West European airplane manufacturers in the field of technology.

That is what a spokesman at Fokker says at the aviation show in British Farnborough, with reference to remarks made this week by top man Henri Martre of the French government firm Aerospatiale.

Martre stated Monday that a number of airplane manufacturers, including Fokker, will start a combined study of the development of a new generation of supersonic planes. It would be a "misunderstanding" to conclude from it that Fokker wants to get involved in building such an 'Avion a Grande Vitesse' [Plane With Great Speed], according to a spokesman.

Martre's remarks come after a combined study report—titled Euromart [European Cooperative Measures for Aeronautic Research and Technology]—which a group of nine West European airplane industries presented to European Commissioner Karl-Heinz Narjes in April. Narjes' portfolio includes, among others, 'industry' and 'research and science.'

The firms in question are: Aeritalia (Italy), Aerospatiale, Dassault (France), British Aerospace, Construcciones Aeronautics (Spain), Dornier, MBB (West Germany), SABCA (Belgium), and Fokker.

At the request of the authorities in Brussels, they made an inventory of research programs which, in their opinion, are essential for future development of the West European aircraft industry, and which can be tackled together without damaging their competition position.

The European firms found that their position has improved considerably over the past years. Their combined share of the world market of civilian airplanes grew to about 23 percent, and to 28 percent where military planes are concerned.

The airplane factory now has more than 100 orders for the original version of the Fokker 100. The first plane of this type, meant for the Swiss airline Swissair, was delivered at the beginning of this year after many delays because the production experienced a difficult start. According to the Fokker spokesman, the construction of a longer Fokker 100 can be "integrated without problems" into the present production line.

Photo Caption

The longer version of the Fokker 100 weighs 20 percent more than the original version. Besides heavier engines, additional fuselage sections in front of and behind the wing, stronger wing panels, and a heavier landing gear are installed. Further, the plane will have to be reinforced at several places.

Fokker Studies Longer, Shorter Versions of F-100

36980004b Rotterdam NRC HANDELSBLAD in Dutch
9 Sep 88 p 11

[Article: "Fokker Studies Longer Version of F-100"]

[Text] Rotterdam, 9 September—Airplane manufacturer Fokker is conducting a market feasibility study for a longer version of its Fokker 100. The new plane is supposed to be able to carry 130 passengers, 30 more than the present version.

Dr R. J. van Duinen, deputy chairman of Fokker, announced this yesterday at the aviation show in Farnborough, England.

Making the Fokker 100 longer is possible now that the British engine manufacturer Rolls Royce has decided to develop the Tay 670, a more powerful version of the relatively economic and quiet Tay 620 turboprop engine which the firm has already been building for the Fokker 100. According to Fokker, no adequate engine has been available for a longer version of this plane.

According to Van Duinen, the Tay 670 offers "an excellent possibility to let the Fokker 100 expand to a family of planes for short- and medium-range distances." The airplane manufacturer is also considering developing a shorter version of the Fokker 100 which is supposed to be able to carry 80 passengers. Nearly identical planes require nearly identical maintenance and training programs, resulting in higher efficiency and increased savings.

Plans for a shorter version of the Fokker 100 are still in a very early stage. According to a spokesman there is not even an 'elementary drawing' yet. The development of the longer Fokker is much more advanced because it appears to attract the most interest. A Fokker with 130 seats could compete directly with the Boeing 737.

Whether the 'Fokker-130' will actually be built, depends on the number of orders. Fokker is currently checking how much interest exists for such a plane, first of all among its present clients. If the number of orders will be 120, they will certainly go ahead and build the plane, according to a spokesman. If the number is less, the decision will depend on the price level. They will look into this matter for no longer than a year and a half. Once the construction of the longer Fokker version has started, the first plane will be ready 3 years later.

The purpose according to the report, is to further expand the market shares of the European industry, and to let the relative importance of the production of civilian airplanes increase at the same time. That means automatically that export will become more and more important.

In order to be able to handle the competition in the future, especially the Americans—the nine European firms confirm before the European Commission—it is urgently necessary that the efforts in the area of research and development in the field of technology, are strengthened in Europe. "More and better cooperation" among the various parties is essential according to the report.

Priorities

Each year the West European airplane industry is still spending about 370 million ECU (more than 860 million guilders). In order to continue to compete successfully in the future it is urgently necessary to increase this budget "immediately" by 25 percent. In the long run the expenditure will have to be doubled, according to the report.

To start a combined approach, the companies involved mention nine priority projects. In the first two years when the various projects will still be in their study phase, some 168 ECU will be needed, the companies are telling Commissioner Narjes. Thereafter the required budget increases fast.

One of the problems which, according to the report, should be studied first, concerns the friction heat of super fast 'hypersonic' planes. That points in the direction of a successor of the Concorde.

But, according to the spokesman of Fokker, the Dutch airplane manufacturer is much more interested in other items which were also mentioned in the report but which Martre of Aerospatiale in Farnborough did not emphasize.

These include projects such as research on new materials and constructions, modern automated control systems, integrated propulsion systems, and resistance reduction.

Combined research, according to Fokker's spokesman, will strengthen the position of the European industry. Besides, a European program coincides with Fokker's own research efforts, and scientific institutes in the Netherlands could be included in the projects.

Photo Caption

The longer version of the Fokker 100 weighs 20 percent more than the original version. Besides heavier engines, additional fuselage sections in front of and behind the wing, stronger wing panels, and a heavier landing gear are installed. Further, the plane will have to be reinforced at several places.

Sweden To Build Large Underground Wind Tunnel

36980010b Stuttgart FLUGREVUE in German Aug 88 p 70

[Article by Helga L. Hillebrand: "Wind Tunnel Below Ground"]

[Text] The only underground wind tunnel is to be built in Sweden. At the same time it will become one of the largest low-speed tunnels outside the United States.

A large number of wind tunnels is in the planning right now. Sweden is no exception in this respect, and yet what is being created on the drawing boards there is clearly different from other concepts. The new Swedish wind tunnel will be located underground. The space for the facility is to be blasted out of massive rock. The working section, the monitoring installations for the scientists as well as the entire closed flow cycle will be placed 50 meters below the surface.

The originator and later to be the operator of the wind tunnel is the FFA [Swedish Aeronautical Research Institute], which has its seat near Stockholm. This research installation has 260 employees, who grapple not only with aeronautical matters, but also with subjects in the automobile industry, energy economy and manufacturing industry in the field of aerodynamics.

The new subterranean wind tunnel is the first of its kind today. In addition, it will be one of the largest low-speed tunnels outside the United States. The working section has a surface of 36 square meters. With a maximum pressure of four bar and a flow speed of 80 meters per second, which is the equivalent of Mach 0.23, Reynolds numbers up to 11.5 million can be achieved. This approaches the Reynolds number of the real aircraft rather accurately, so that the aerodynamic predictions become more precise. This accuracy of measurement also benefits the low turbulence region of the flow, which occupies only 0.1 percent of the working aperture, as well as the low deflection of the flow.

The Facility Will Also Be Open to Other Countries

The models are prepared for measurement on a platform, which lies in an administration building above the wind tunnel, and from there they are lowered by an elevator to the measurement level. Two additional platforms are located there, on which finished models are waiting for the working region. In this manner the working region itself can be efficiently used. It is not blocked during the time-consuming work of fitting the models with electronic measuring devices.

The facility is to begin operation toward the end of 1993 or the beginning of 1994. The cost is estimated at 400 million Swedish kronor, about DM 115 million. The FFA will use half of the experimental time for the national aeronautics and automobile industry. The remaining time is available to international institutes and enterprises against payment.

Military Satellite To Be Launched

36980080a London PRESS ASSOCIATION in English 6 Dec 88

[By Fubkat Marshall, PRESS ASSOCIATION]

[Excerpts] Britain launches its own special military mission in space on Friday [9 December] when the Skynet 4 satellite is sent aboard the European rocket Ariane. The top secret satellite will provide better communications for British forces around the world.

The Skynet, which will provide increased strategic and tactical communications, will be launched from Kourou, French Guiana.

It should have gone up with the U.S. shuttle, but because of the fatal Challenger crash in January 1986 the system was redesigned for an expendable vehicle launch by rocket.

This is the first time NATO has ordered equipment which has not been developed in America.

The second Skynet satellite is scheduled for launch in August next year and the third in May 1990.

BIOTECHNOLOGY

FRG Genetic Research Grows Despite Restrictions, Opposition

36980021a Frankfurt/Main FRANKFURTER ALLGEMEINE in German 4 Oct 88 p 20

[Article by Lothar Hoja: "Biotechnology Encountering Resistance in the FRG: Lap in Research Compared to Other Countries Nonetheless Diminished: Public Funding"]

[Text] Frankfurt, 3 Oct—America, you have a better life! In Goethe's "Faust," this lament refers to old stones, while today the context is new technologies. In the United States, the "acceptance climate" for biotechnology and genetic engineering is considerably better than in this country. According to a survey, two-thirds of the population there is positively inclined towards it, while the same percentage in the FRG is somewhere between skeptical and worried. For German companies in this sector, this has far-reaching consequences.

The fourth ordinance to the Federal Emission Protection Act, which has been in effect since 1 September, stipulates that a public hearing is required for all approval processes pertaining to facilities in which work is being done with cells or organisms that have been modified using genetic engineering. Because of negative public opinion, many companies are afraid that these hearings will mean a delay of many years in approval for their planned facilities; for this reason, they sense "unfavorable basic conditions" in this country. Invitron, a company established at the Medical Park in Hannover, was sharply criticized because it submitted its approval applications prior to 1 September in order to avoid the hearing. Bayer AG has already announced that it will be moving production of genetically engineered coagulation factor VIII to Berkeley, California. Similar considerations are known to be circulating at BASF.

However, fear of the dangers of genetic engineering is apparently not at all a specifically German concern. If one is willing to believe statements by scientists from the GDR, a very lively, but in no sense controversial debate on the subject is being carried out there. It is also undisputed among experts that there are in fact potential risks involved with a misuse of genetic engineering. For

that reason, many of the fears appear to be quite understandable. However, there is a similar degree of unanimity in declaring that there are no dangers involved in most areas of application of biotechnology and genetic engineering. For example, when an organism such as baker's yeast, which is used by the kilogram in every bakery, produces, in a closed vessel, a hormone (insulin) that is circulating in every healthy human body. Through education, the federal government and industry are attempting to counteract the fear that in their opinion is unjustified. The chemicals industry, for example, is supporting a television series on biotechnology; the Federal Ministry for Research & Technology is supporting high school teacher training.

In the process, the FRG in recent years has closed a seemingly unclosable gap in research and development with respect to the United States and Japan. The potential of genetic engineering is tremendous. At present, experts are figuring on an international market of $260 billion per year, with a sharp upward tendency. In its TOU program [Technology-Oriented Business Startups], the Federal Ministry for Research & Technology is supporting primarily small and medium-sized companies that are developing new biotechnology products and processes. The coordinating center for these activities is the Juelich nuclear research facility. However, some of these subsidies are yielding ludicrous fruit indeed.

One example that can be noted is the Hans Barth winery in Hattenheim, which presented the first nonalcoholic Rheingau-Riesling wine using biotechnology, followed by the "sparkling," a nonalcoholic champagne. In previous processes for removing alcohol from wine, the alcohol was always distilled out, whereby the resulting heat greatly damaged the flavor. Vintner Norbert Barth invented a method for passing high- quality wine through a dialysis membrane, so that the flavor is fully retained.

An entrepreneur from Franconia, who similarly received massive funding from the federal government, has also been the subject of criticism. His work was praised in the local press as a pioneering development, because it was supposed to remove nitrates from drinking water in an extremely simple manner. The water flows through a small cylinder filled with bark mulch, and the bacteria there eat up the nitrates. A large number of these devices have reportedly been sold by the inventor to companies such as breweries. The catch is: It does not work nearly as well as it is said to, at least at the indicated flow rates. In the words of a representative of the Bavarian Land Trade Association, which served as a consultant to the project, for a real reduction in nitrates the flow speed would have to be significantly lower.

In anticipation of the European domestic market in 1992, the European Community is also eager not to lag behind and has begun a program under the name "Eclair." This program is intended to support biotechnology and genetic engineering in agriculture, and was presented at a seminar of the German Agriculture Association (DLG). But given the poverty of the EC, there will presumably be little funding for applicants. A total of 80 million ECU is provided for, which is to be distributed among no more than 50 projects and over the course of 5 years. This means around DM 400,000 per project.

COMPUTERS

FRG: Suprenum Supercomputer Progress Report

Prototype Ready by Year's End

36980387 Duesseldorf HANDELSBLATT in German 14 Jul 88 p 11

[Annual Report of the Assocation for Mathematics and Data Processing: "Prototype of the Supercomputer Suprenum To Be Finally Ready by Year's End"]

[Text] HANDELSBLATT, Wednesday, July 13, 1988—sgr BONN—"By the end of the year, the prototype of the Suprenum will be ready." This is the prognosis of Prof Gerhard Goos, board member representing science and technology in the GMD [Organization for Mathematics and Data Processing], delivered on the occasion of the presentation of the 1987 GMD annual report in Bonn.

Goos said the "parallel multiprocessor system" product is to be introduced at the CeBIT fair next spring. However, he conceded at the same time that the predictions he had made a year ago could not be met in full. This new delay was due to "technical difficulties" and "coordination problems." At present 23 large-scale research institutes, industries and universities are participating in the Suprenum project, which involves the development of a supercomputer for numerical uses. The GMD research center "First" has taken the leading role in planning and implementation. The Suprenum GmbH, in which the GMD holds a stake together with two partners from the private sector, has been established for project coordination.

Despite this renewed delay Prof Goos still believes they are in a good position with regard to international comparison, "The first Suprenum will usher in a new era of programming." From the very beginning, a major goal was to develop not only hardware but the necessary software as well. Mr Goos noted, "Thus we will introduce not only the computer, but also its applications at the CeBIT fair." Prof Gerhard Seegmueller, chairman of the board at GMD, added that earlier principles of architecture had been fully exhausted and the Suprenum concept had now developed into a trendsetter in this field on an international scale.

The presentation of the GMD annual report was to demonstrate at the same time that the government facility for major research "has in many cases maintained or newly conquered, internationally acknowledged top positions." Priorities in research programs are

expert systems and artificial intelligence, development of software and hardware. In March, the state of Hesse joined the partners, now holding a share of 10 percent together with North-Rhine Westphalia. The West German government will provide 90 percent of start-up financing. Last year's budget was about DM 105 million, DM 80 million of which were financed by the partners. The rest was financed through research contracts and cooperative projects. As the result of takeovers, the number of employees has increased to 1350 (about 1000 at the end of 1987); this year's budget is estimated at about DM 150 million.

The task of GMD—basic research for the development of powerful computer programs for new generations of computers—can be best explained through the use of examples. With "Babylon," the GMD scientists have created an "expert system for the creation of expert systems." This is defined as an "information tool box, which helps the knowledge engineer to structure and reprocess the specific knowledge compiled by experts in such a way that the computer can process it."

The development of the "L3"operating system, designed for operation with the state-of-the-art processor for personal computers, the Intel 80386, is said to be a "minisensation". The combination of Intel 80386 and "L3" transforms a PC into a multi-user/multi-tasking system. For example, while one user is working with the computer for data-processing purposes, another could be printing out hard copy, a third person entering data and someone else could be working with the computer's graphics program. In view of the vast number of developers who have been developing an adequate operating system for the Intel processor for years, Goos comments, "Reflection is sometimes more useful than the resources utilized by many people. Scientifically well-founded work often results in success faster than brute force." A GMD team of ten people is working on the "L3" project.

Description, Marketing Data

36980387 Frankfurty/Main FRANKFURTER ALLGEMEINE in German 3 Aug 88 pp 27-28

[Article by Kristin Mierzowski: "A Computer for Parallel Data Processing—Increasing Performance Requirements, New Computer Architecture Needed—Suprenum Project"]

[Excerpts] Eamonn Wilmott, publisher of the book "Supercomputing Review"—published this summer in the United States—declares, "Europe's strength in supercomputers is without a doubt to be found in the field of parallel processing." The U.S. computer magazine "Datamation" places particular emphasis on West German developments in so-called parallel computers, whose leading computer, "Suprenum," has been supported by the Ministry for Research and Technology. Apparently the Americans had recognized the implications for science and research in the Suprenum project much faster than the Europeans, many of whom are still evaluating the project with marked caution.

[Passages omitted]

The Suprenum is based on so-called nodal computers, each of which includes a common micro-processor, i.e. a vector processor with a capacity of 16 megaflops, a communication processor and a memory of eight MB. Up to 16 nodes are networked by a high-speed link to form a cluster. These clusters are combined into larger configurations. The prototype of the Suprenum, targeted for completion by the end of 1989, will therefore include a total of 16 clusters. It can reach a peak performance of 4 000 megaflops. Such a system of clusters constitutes the basis of the supercomputer, which is operated with the help of a preprocessor.

One difficulty in the cooperation of several parallel processors working on the solution of the same problem concerns communication between the processors, since it is the time required for this communication which determines how efficiently the task can be executed. [Passage omitted] Communication between program units, e.g. to exchange the results of calculations, is handled by the Suprenum through the transmitting and receiving of messages. The effective execution of this exchange of messages is of great importance in terms of the processor's performance. Parallel hardware alone is not sufficient, however. In order to fully utilize all processors equally, the algorithms used for calculations must themselves possess sufficient parallelism. A preliminary version of the Suprenum-processor has evidently yielded good results to date. It has also become clear that the programming of highly parallel computers is not as complicated as originally feared. About half of the research funds were invested in the development of software. When the first Suprenum models are delivered as planned in 1990, extensive application programs and programming tools will be already available, which will greatly facilitate the introduction of the new processor.

Italy's CNR To Finance R&D in Parallel Computers

36980391b Milan SISTEMI E AUTOMAZIONE in Italian Jun 88 p 489

[Text] At the scientific symposium held at Milan in April by the CNR [National Research Council] during Milan's so-called "Grande Fiera" [Big Show], Professor C. Maioli, of the University of Bologna, unveiled the new targeted project titled "Data Processing Systems and Parallel Computing" which has just been launched over the past few weeks. The intent of this project is to provide "a focusing of research in the precompetitive phase, a stimulus and incentive to involvement on the part of the cutting-edge firms and their cooperation with academic research efforts, emphasis on the integration of

traditional software systems with innovative methodologies and products, and on the design of processors specific to new areas and architectures, and an overall organizational structure." Projected funding comes to around 70 billion lire over a period of 5 years, a rather modest amount by comparison with a similar British project (350 billion) or with the European ESPRIT project that is being funded to the extent of 1 billion ECU (approximately 1,500 billion lire). The project is currently in the phase being devoted to evaluation of research proposals, which have numbered almost 500—versus some 120 fundable units of research—in the sector of "Intellectual Work Aid Systems" (10 versus 112) and "Data Base Systems" (12 versus 91) [as published]. The purposes of the Data Processing Systems and Parallel Computing Targeted Project are as follows:

— To raise the innovative level of the Italian software industry and of its associated scientific community, supporting them in the development of advanced software methods and prototypes in innovative sectors such as intelligent and multimedia data bases, expert systems, conceptually new languages, and computerized tools for the building and operating of software systems. The reference is to the "Software Systems" area.

— To promote activity aimed at integrating current data processing technologies with artificial intelligence technologies and with the results of more advanced research on processors, architectures, and languages. The area of reference is "Processors, Architectures, Languages."

— To enhance Italy's position within the sphere of the technological and methodological innovation in scientific computing that began in the United States over 10 years ago with the creation there of a "parallelism cult," through the realization of tools in Italy for facilitating the use of supercomputers to resolve highly complex scientific problems and for designing technologically sophisticated products. The reference is to the area of "Scientific Computation for Large Systems."

In keeping with these aims, 7 subprojects and 2 support initiatives have been set up as follows:

—*In the Scientific Computation for Large Systems area:*
1. Scientific Computation for Large Systems Subproject;

—*In the Processors, Architectures and Languages area:*
2. Dedicated Processors Subproject;
3. Parallel Architecture Subproject;
4. Conceptually New Language Subproject;

—*In the Software Systems area:*
5. Evolutive Systems for Data Bases Subproject;
6. System Design Methods and Tools Subproject;
7. Intellectual Work Aid Systems Subproject.

Support initiatives (combined into one subproject for administrative convenience):
8.1 Parallel Computing;
8.2 Software Engineering.

The projected products for the three areas are:

- Software systems, program libraries, and a commercial supercomputer access network;
- Hardware and software modules, prototypes based on parallel architectures, methodological tools for the new programming environments;
- Evolutive systems for the management of data, tools for specifying and interactive supports for the operation of software systems, and prototypes of expert systems.

Italy: Acoustic Front End for Voice Recognition

3698m523 Turin CSELT TECHNICAL REPORTS in English No 5, Aug 88 pp 455-459

[Scientific paper by A. Albarello, E. Lenormand, J. Potage, J. P. Riviere, Thomson SFDTC, Gennevilliers, France; R. Breitschaedel, N. Scheibel, AEG Aktiegesellschaft, Ulm, Germany; A. Ciaramella, R. Pacifici, G. Venuti, CSELT, Torino. The paper was presented at the "Digital Signal Processing'87" conference held in Florence, September 1987. This work was partially supported by the EC in the framework of the ESPRIT program, in project No 26 "Advanced Algorithms and Architectures for Voice and Image Processing."]

[Excerpts] We describe an Acoustical Front-End (AFE) for speech recognition devised for large vocabulary applications, which extracts a lattice of word hypotheses in real time from the input speech, feeding a subsequent speech understanding stage. The recognition algorithm is based on a two step refinement procedure, in which the first step extracts a subset of possible words and the second step verifies only the words of the chosen subset; each step involves a parameter extraction and a recognition stage. Given heavy real time computational requirements, the AFE has a multi DSP architecture, centered around the VME bus and using the VERSADOS real time operating system. Two blocks have been specifically designed for this application: the digital signal processing section using a TMS32020 DSP, and the acquisition section. Some details of the interprocessor data flow and system control are also reported.

1. Introduction

The Acoustical Front-End (AFE) described here and developed in the framework of the ESPRIT program[1] is intended to extract from the speech input a lattice of word hypotheses for large vocabulary applications, of the order of a thousand words: this AFE will be cascaded to a subsequent understanding stage.

This AFE algorithm therefore not only extracts acoustical parameters, but also hypothesizes a lattice of words

with a two step strategy, first quickly identifying possible sets of words (cohorts), then refining this choice with more time consuming computations only for the more plausible words, as described in more detail elsewhere.[2]

Footnotes

1. G. Modena, *Speech Processing: An Outlook on ESPRIT Founded European Research International Workshop*, Recent Advances and Applications of Speech Recognition, Rome, (27-29 May 1986), pp 13-27

2. P. Laface, G. Micca and R. Pieraccini, *Experimental Results on a Large Lexicon Access Task*, ICASSP 87, Dallas, pp 20.4.1-4.

FACTORY AUTOMATION, ROBOTICS

EUREKA Conference Adopts Factory Automation Projects

36980005a Paris ROBOTICS in French 30 Jun 88 pp 1-3

[Article: "Status of EUREKA Projects At the End of the Copenhagen Conference"]

[Text] The conference of the ministers of the 19 European countries involved in EUREKA and the representative of the Commission of the European Communities took place on 15 and 16 June in Copenhagen, bringing the Danish presidency to an end. It began the Austrian presidency. The next conference will be held in Vienna on 18 and 19 June 1989. The conference demonstrated that the program is functioning well even though certain criticisms came to light, especially on the subject of commercialization of the projects. The market will be the judge of that 2 years from now when the first products are launched. Fifty-four projects received the EUREKA label, including 21 with French participation. Since its creation in the spring of 1985, this program has represented a total of 213 projects, including 102 with French participation. Their total cost stands at 4.75 billion ECU, or approximately Fr 33.3 billion (combining private financing and public contributions). The selection has centered primarily on sectors close to the market such as factory automation. Thus, the FAMOS project, whose objective is to increase the hardware for flexible assembly systems in companies in order to reverse the decline of European industry, has been cited as a model. We are, incidentally, witnessing a reduction in the duration of projects (less than 5 years) and in their cost (generally less than Fr 350 million).

Although since the beginning of EUREKA the majority of the early projects have dealt with information technologies, robotics/factory automation, and transportation, today the biotechnologies and the medical sector are the most heavily represented. At the present time, 46 of the projects still involve robotics/factory automation.

PROJECTS ADOPTED IN ROBOTICS/FACTORY AUTOMATION INVOLVING FRENCH PARTICIPATION

EU 240—Tasque

Creation of a group of tools making it possible to anticipate, evaluate, and test the quality of software under development. Lead companies: CEP (France), TUeV Hamburg (W. Germany). Interested in the project: NCC (UK), ENEA (Italy). Total: Fr 36 million, including French participation of Fr 14.8 million. Duration: 4 years.

EU 241—FAMOS: Arcade

Automated assembly shop for subassemblies used in manufacture of clutches for private automobiles (disks, covers...). Lead companies: Valeo (France), DEA (Italy). Total: Fr 131.6 million, including French participation of Fr 72.3 million. Duration: 4 years.

EU 249—Transformation Technologies Using Lasers

Creation of a data base on CO2 and yag laser applications. Then, production of yag machines for specific applications. Air Liquide's goal is to master cutting and welding through a better understanding of the effect of auxiliary gases. Lead companies: Anyak Industries (Spain), Air Liquide (France), Osai (Italy), Lumonics (UK). Total: Fr 140 million, including French participation of Fr 26.9 million. Duration: 5 years.

EU 261—Europari (definition phase)

Projects under this rubric involve computer assisted production management applied in the aeronautics sector. The objective of the definition phase is to identify other industrial sectors capable of contributing to projects of the Europari type and to use their results. Lead companies: Casa (Spain), Aerospatiale (France), Aeritalia (Italy), British Aerospace (UK). Interested in the project: MBB [Messerschmitt Boelkow Blohm] (W. Germany). Total: Fr 28 million, including French participation of Fr 7.8 million. Duration: 1 year.

EU 262—FAMOS: Fame

Research, development, and construction of a flexible assembly shop to manufacture gas flowmeters. Lead companies: Sormel (France), Kromschroeder (W. Germany), Thorn EMI (UK). Total: Fr 168 million, including French participation of Fr 56.8 million. Duration: 5 years.

EU 284—FAMOS: Flexible Refrigerator Assembly Plant

Research, development, and construction of a flexible refrigerator assembly plant. Lead companies: ICI (Belgium), Safel (Spain), Selnor (France), Cannon Crios (Italy). Total: Fr 60 million, including French participation of Fr 29 million. Duration: 4 years.

EU 285—FAMOS: Flexible Shoe Assembly Plant

Research, development, and construction of a flexible shoe assembly plant. Lead companies: Inescop (Spain), Imbert (France). Total: Fr 43 million, including French participation of Fr 20 million. Duration: 4 years.

EU 287—Murex

Technical and economic study of an automated modular system for inspection, maintenance, and repair of underwater parts of marine structures. This system uses artificial intelligence, thus permitting decentralized control and improved tool efficiency. Lead companies: Subsea Industries (Belgium), ECA (France). Total: Fr 7 million, including French participation of Fr 3.5 million. Duration: 1 year.

PROJECTS WITHOUT FRENCH PARTICIPATION

EU 259—Expert Systems for Welding

Knowledge and acquisition of data in areas specific to welding. Derivation and integration of expert systems to formulate the information system on soldering technology. Lead companies: Welding Institute (UK), IVF (Sweden), Svejsecentralen (Denmark), TNO (Netherlands), Sintef (Norway). Total: 3.7 million ECU. Duration: 36 months.

EU 265—FAMOS: Planet (definition phase)

Feasibility study for electronic control of production units in the automotive industry. Lead companies: Magnetti Marelli (Italy), Jaegger Iberia (Spain), Assembly Factory (Finland), Danfoss (Denmark). Interested: Jaegger (France). Total: 1 million ECU. Duration: 9 months.

EU 276—FAMOS: Development of Sensors for Robotics

Development and integration of elements currently lacking for future sensor-guided assembly processes: development of strategies for signal evaluation for programmed guidance systems and processes, robot control, etc. Lead companies: OL Delft (Netherlands), Krone (Austria). Total: 10 million ECU. Duration: 48 months.

EU 288—FAMOS: Hifas

Automated assembly technology for small and medium-sized units. The project includes manufacture, tools, assembly cells, logistics and data flow, and the pilot unit. Lead companies: Andreas Stihl, PHG/IDA (W. Germany), Piaggo (Italy). Total: 7.5 million ECU. Duration: 39 months.

EU 289—FAMOS: CAD and Assembly Planning

New procedure for analysis and improvement of manufacture of products. Integration into assembly planning. Extension of assembly improvement to integrate cost factors. Lead companies: Lucas (UK), FRG (W. Germany). Total: 10.8 million ECU. Duration: 54 months.

EU 295—FAMOS: Flexible Assembly Line for New Generation Relays

Development and testing of new manufacturing and assembly methods for the future generation of relays. In one of the pilot projects, a new manufacturing and assembly line will be installed with maximum flexibility and automation. Lead companies: Schack Elektronik (Austria), Wunsch Systeme (W. Germany). Total: 8.5 million ECU. Duration: 36 months.

SUPPORT FOR INDUSTRIES

Noteworthy conference developments in this area deal with:

- Production during the Danish presidency of a guide book, now available, for drawing up international cooperation agreements;
- Study of insurance against the financial risk taken by companies. Interest in setting up insurance to reimburse, in the event of project failure, approximately half of the expenses paid out by the company, has been demonstrated in France. This type of coverage is desired by 90 percent of the French companies polled (77).
- The conference of ministers entrusted the Austrian presidency with the task of putting in place a structure with the dual role of coordinating all projects to assure their coherence in terms of infrastructures and providing the liaison between Eureka and all European initiatives.

Eureka (French office). Phone: 47.23.55.28.

MARINE TECHNOLOGY

New French Submarine Programs Described

Submersible Saga Operational by End of Year

36980018a Paris L'USINE NOUVELLE in French (special L'ANNEE TECHNOLOGIQUE 1988 issue) Oct 88 pp 43, 45

[Article by Michel Vilnat: "Saga: An Autonomous Undersea Workshop"]

[Text] Designed for 10-day missions with no outside help, the Saga submarine owes its unique performance to its Stirling engines and an original oxygen storage device.

Late in 1988, the civil submarine Saga (a wide-range support submarine) built by Comex [Maritime Appraisal

Company] in close cooperation with Ifremer [French Institute for Research on Ocean Development] will become operational. It will be the outcome of a project without equivalent in the world. Launched in 1983, it reused the strong hull of Commandant Cousteau's former Argyronete.

Designed to serve the industry, the fully-autonomous Saga will complete missions lasting 10 days at a distance of up to 250 km from its home port, without any outside support. A major asset when weather conditions prevent any pressurized-caisson dives from a surface ship. It will travel at an average speed of 7 km/h, at depths of 50-200 m, before diving to its work site. Once on location, it will be able to go down to 600 m, and even to land on the sea bottom with its four retractable legs.

Until now, all assembly, repair and inspection work on offshore drilling facilities required a ship to carry the equipment on location and to supply the diving caisson with power and gas. But the Saga is an autonomous submersible with its own propulsion and fuel storage systems. It uses several engines: one 175-kW Hispano-Suiza diesel which is used only when the Saga is on the surface, and two 75-kW Stirling engines which propel it and provide its power supply through powerful batteries.

Ifremer and Comex engineers chose the Stirling engine because of its outstanding efficiency, which reduces the amount of fuel required. Also, contrary to traditional diesels, it has a pressurized combustion chamber making direct exhaust possible down to 200 m. At greater depths it uses an overpressure system.

However, the development of that engine by the Swedish company United Stirling proved long and difficult. Currently, the two engines have been ordered but not yet delivered, and they are not expected to be installed permanently before the end of the year. This complex equipment consists of three parts: one pressurized combustion chamber where pure oxygen and fuel are burned; one heat exchanger; and one fluid (helium) circulating in a closed circuit. Helium, alternately hot and cold, expands and then contracts as it actuates pistons (the Swedish engineers encountered problems with piston tightness).

To avoid using long drive shafts, which often pose tightness problems, the engineers turned to hydraulics. Fixed tubing connects the hydraulic engines, which are directly coupled to the propellers and to the high-pressure pumps of the hull.

The crew being smaller than on a traditional submarine (6 or 7 men), Comex engineers had to automate the pilot's cabin to a large extent: it is controlled by only 1 man; there is also only 1 man to check the parameters (pressure, temperature, quality of the gas mixture) controlling the pressurized caisson which can take 6 divers to a depth of 460 m. To ensure the crew's survival and the engine "gas" supply, original storage systems had to be developed, in particular for oxygen: the oxygen volume represents the equivalent of 10,000 kW/h, whereas a traditional military submarine weighing 1,500 tons (the Saga weighs only 297 tons) will store only 6,000 kW/h! Comex and Ifremer engineers had to use cryogenics; 6.5 tons of oxygen are stored in liquid form (a premiere for a submarine), the rest is in cylinders, pressurized to 400 bars: twice the usual pressure. Spiflex, a subsidiary of Coflexip and Spie [Parisian Electrical Industry Company], wrapped the steel cylinders in Kevlar to strengthen them. That doubled the cylinder strength but their weight was increased by only 15 percent.

Thanks to the considerable efforts that were made to lighten the Saga (its outer hull is made of composite), it can carry 3 tons of equipment plus a small remotely-operated vehicle (ROV) similar to the Robin that was used to search for the Titanic. This ROV will be used to inspect pipelines and well heads down to 600 m. In other words, the Saga will be able to access 90-95 percent of offshore facilities. Yet, it will not work only for them: the exploration of wrecks, the recovery of the black boxes from aircraft fallen at sea, and the monitoring of and intervention on wrecks containing pollutants represent several potential markets.

Observation Submarine Elit Under Development

36980018b Paris L'USINE NOUVELLE in French (special L'ANNEE TECHNOLOGIQUE 1988 issue) Oct 88 p 45

[Article: "Elit: An Eye at a Depth of 1,000 m"]

[Text] Equipped with a camera and a sonar, this undersea robot will transmit to the surface the data collected from a fixed point.

In cooperation with Alsthom ACB, Thomson Sintra, CGA [General Automation Company] HBS [Hotchkiss Brandt Sogeme] and the CSEE [Electrical Signals and Projects Company], Ifremer [French Institute for Research on Ocean Development] is developing an observation submersible controlled by acoustic waves. It is called Elit (unmanned remote-controlled untethered craft) and will be capable of diving to a depth of 1,000 m. Equipped with a camera and a sonar, it will collect data and record them or transmit them directly to the surface. Six electric motors, controlled by an on-board computer, will enable it to remain at a fixed point in the middle of water. In a one-knot current, it will have a 4-hour autonomy.

French Robotics Industry Increases Use of AI

36980037b Paris ZERO UN INFORMATIQUE in French 26 Sep 88 p 46

[Article by Anne-Marie Vziat: "Third Robot Generation in Toulouse"]

[Text] Faced with the decline of manufacturing robotics, researchers and manufacturers are turning to submarine and intervention robotics.

When it comes to robotics, Toulouse has demonstrated its international expertise for several years already. The pink-brick city owes its dominant position to the advanced training dispensed by the Paul- Sabatier University, the National Institute of Applied Sciences, and the Toulouse National Polytechnic Institute; to the presence of a Firtech pole (Training for Research in Spreading Technologies) supported by three advanced-studies diplomas (DEAs), in automation, data processing and mechanics; and also to the fame of its research laboratories which date back to the 1960's.

The LAAS (Laboratory for Automation and Systems Analysis), a regional and national kingpin of robotics and computer-integrated manufacturing [CIM], has lost count of all the licenses and technology transfers it initiated. Paradoxically, although training and research predominate, the industry has had trouble keeping up with them in these sectors. In 1984, to coordinate the activities of local CIM-oriented companies and organizations, the regional council created a public interest group, Promip (Midi-Pyrenees CIM); its goal was to promote the development of CIM-applied research and to provide impetus to the regional industry in this respect.

Malaise in Manufacturing Robotics

The years 1984-1985 saw the creation of smaller industries oriented toward manufacturing robotics, which developed products based on research completed in Toulouse. For instance, Midi-Robots, specialized in independent mobile robots, Aico (Automation Data Processing Control), Midi-Capteurs, offering touch-sensor applications, and Logabex which at first worked on the development of submarine assembly systems, and then developed its own robot for applications involving heavy loads or where obstacles had to be avoided.

In recent years, however, the creation of businesses of this type has not met with the same enthusiasm: designers now tend to turn to software or artificial intelligence companies.

After developing a mobile cleaning robot which the RATP (Independent Parisian Transport System) uses in the Paris subway, Midi-Robots experienced some difficulties. This small to medium-size industry, created on the initiative of research laboratories and with the CNRS [National Center for Scientific Research], the Onera [National Office for Aerospace Studies and Research] and large companies such as Matra [Mechanics, Aviation and Traction Company] and Sesa [Automation Systems Development Company] as shareholders, was taken over a few months ago by two cleaning companies, Comatec and Onet. The two new partners own each 39.5 percent of the stock; the shares owned by the CNRS and Onera were considerably reduced. Today, Midi-Robots is getting reorganized, focusing its operations mostly on independent mobile robots; it hopes to get out of the red within 1 year and to launch its industrial and commercial development. It expects to achieve sales of Fr8 million this year, and Fr15 million in 1989.

For Georges Girald, CNRS research director and in charge of Firtech, "the problems which manufacturing robotics is facing today result from economic conditions which are not just regional or national, but international. We went all the way with some applications, especially in the industrial field." But the CNRS research director believes that this "situation is the prelude to a revival of robotics in a far more sophisticated form."

Georges Giralt, who is also in charge of the "robotics and artificial intelligence group" at the LAAS, also acknowledged that an increasing number of European projects favor the non-manufactured [sic] aspects of robotics. His team is still performing some basic research related to the manufacturing industry, but it is not a priority; and they are engaging in sectors such as space robotics (in particular with the CNES [National Center for Space Studies], submarine robotics and intervention robotics.

"At present, the research program of the 'Robotics and Artificial Intelligence' group is essentially geared to problems of third- generation robots. Research involves the development of concepts, methods and tools designed to make robots highly flexible and adaptable to their tasks in spite of the inaccuracies and uncertainties linked to the tasks and their internal state."

Priority to European Projects

Georges Giralt's group is not just working on experimental models, in particular Hilare II, an independent mobile robot equipped with multisensorial perception sensors (3-D vision, dynamic vision, etc.) and real-time reasoning; it also participates in cooperative research projects. The latter include two Eureka (European Research Coordinating Agency) projects: Prometheus and AMR (a mobile intervention robot project for civilian rescue operations). The group also works for the Esprit (European Strategic Programs for Research and Development in Information Technology) program with Skids, a multisensorial fusion machine project.

In addition, much work is done under research contracts with companies— e.g., a monitoring robot for Shell, and a monitoring and intervention robot for Framatome—as well as under international contracts: two LAAS research teams are working on a scientific project with the Berkeley University in the United States, and on a submarine robot project with the University of Philadelphia.

While European projects define the main developments in robotics and CIM research, the laboratory pursues a policy of technology transfers with small regional businesses. For instance, the "Artificial Intelligence" team is developing expert-system software in cooperation with Edia, a Toulouse company.

Georges Giralt tends to believe that "this software aspect has better chances of succeeding and it is preferable to favor the system aspect." For its part, the region is getting an increasing number of local manufacturers to join Promip. Late in 1987, the Promip public interest group associated Techlog (Software Technology Company) with Aerospatiale and supported it in a joint project with the latter to develop software introducing artificial intelligence tools into production management.

Increasing French-Spanish Cooperation

Promip was also considered for a project introduced under Famos (a program which obtained the Eureka label in 1986). For this project, the Promip public interest group, which entrusted the design and engineering work to a Toulouse company, Aico, has several partners: a shoe manufacturer of the Lot-et-Garonne, the Imbert company, Spanish manufacturers and the Spanish technical center for the leather industry. This French-Spanish project is designed to bring integrated automation to flexible assembly workshops; scheduled to last 4 years, it should lead to the creation of two pilot workshops, one in Miramont-de-Guyenne (Lot-et-Garonne) and the other in Spain.

Other French-Spanish projects are on the agenda, in particular under a European contract signed by the LAAS and a Spanish company to apply robotics to ore extraction problems.

The two countries also cooperate on European training agreements through the Comett program; in particular, CIM research is done at the Toulouse National Polytechnic Institute. Already, seminars on sensors have been held, half in Barcelona and half in Toulouse. A similar seminar on CIM is contemplated.

According to Alain Costes, the LAAS director, "these seminars could constitute the start of the European CIM Institute," a project that the Midi-Pyrenees region has been supporting for several years although it has not yet been approved by the ministries involved.

Italy's Italtel Institutes CIM for Electronics Production

36980005c Paris ROBOTICS in French
28 Jul 88 pp 4-5

[Article: "GE Fanuc Automation and Italtel Implement CIM Project in Sicily"]

[Text] Italtel, Italian telecommunications industry leader, recently announced the consolidation of its Linia UT series at its Carini site in Sicily. The project includes an R&D laboratory, a production shop, and a quality control shop, all fully automated. According to Marisa Bellisario, Italtel general manager, Carini will be one of Europe's most modern communication system development and production units. The decision to invest in such a unit was motivated by the strong growth in demand for automatic switching equipment of the above-mentioned series whose production is expected to multiply by five by 1992 and will represent 70 percent of Italtel's total volume. Beginning in 1989, production of printed circuits will reach 400,000 units, twice that of 1987.

The success of this project required use of the computer integrated manufacturing (CIM) concept in production and in control of manufacturing. Visits by an Italian team led by Sandro Guidoriggi, Linia UT's production manager, to the Fanuc plant located in Fuji, Japan (techniques of assembly and testing), in Europe (CIM) to the GE Fanuc Automation Center (Frankfurt), and to Tennessee in the United States resulted in the signing at the EMO in Milan in 1987 of an agreement in principle between Marisa Bellisario and Dr Inaba, CEO of Fanuc and president of GE Fanuc Automation, made official in November 1987. The first research phase was completed in June.

The Electronics Automation Division of GE Fanuc grew out of the project. Its activities are focused on research and creation of electronic hardware production shops. It has created virtually all the electronics production installations of the GE Fanuc factories, which have been significantly renovated during recent years, as well as shops for Boeing, General Dynamics, GTE, Siemens, and Chrysler Motors. Its experience also extends into the military and space sectors, both in batch production and in large-scale continuous production.

All the projects developed during recent years integrate management tools into their automation plan. Electronic Automation developed specific tools for design assistance, for modeling and static and dynamic simulation, and for evaluation of cost and flow modeling needs.

A team from the division and from GE Fanuc Automation Europe is going to work in cooperation with Italtel's personnel to create the overall plan for assembly and testing in the telecommunications sector. This plan will define in detail material flow, inventory, and handling. The team's objective is to create production architecture capable of meeting the needs of the 1990's; it is also responsible for planning the integration of new machinery to permit a smooth transition while continuing to cover production.

UK: Advanced Robotics Research Project

36980005b Paris ROBOTICS in French
28 Jul 88 pp 1-2

[Article: "Substantial British Effort in the Area of Advanced Robotics"]

[Text] Sixteen British organizations have responded affirmatively to a proposal from the British Department of Trade and Industry (DTI) to jointly develop a new

generation of robots capable, if need be, of working independently of any human intervention in extreme, hostile, or nonstructured environments.

The project is administered by Salford University Business Services (SUBSL). Work can begin immediately within the Advanced Robotics Research Center (ARRC), specifically set up at Salford for this purpose. It will operate with a 15.8-million-pound budget over the next 5 years, with the greater part of these funds earmarked for operation of the center for the first 3 years. Five million pounds will be provided by DTI, 7 million by the cooperating organizations through their personnel, 2 million by consulting contracts. During the second year, 1.8 million pounds will be injected as venture capital or property rights transfers. The ARRC should become autonomous after this period.

Its objective is for the long term, less for development of new products than for improving knowledge and coordinating expertise in a field where most of the industrial players cannot support the substantial research costs without assistance. Several robotics sectors still in their infancy are involved, for example, the area of sensors to permit a robot to move in nonstructured environments, artificial intelligence adequate to permit it to interact independently, etc., although a few commercial applications in these areas are already appearing.

The project includes eight major research sectors: sensors, actuators, control, engineering systems, artificial intelligence, man-machine interfaces, navigation planning and mobility and locomotion tasks. Eight research demonstration projects have been proposed, specifically three guidance and dimensional positioning systems, three manipulation task planners, and three technological demonstration projects [as published]: an intelligent remote-control operator for the nuclear field, an advanced cooperative robotics system for welding in particularly confined and inaccessible spaces, and a mobile platform capable of operating autonomously on nonstructured terrain.

Each of the participating members will support a research specialist at the center which will include both small and large companies, an academic institution, and a governmental research establishment.

The 16 participants currently involved are British Nuclear Fuel, Hunting Engineering, GEC Marconi, National Nuclear, Royal Signals and Radar Establishment, Slingsby Engineering, SUBSL, Grad, SD-Scicon, Taylor Hitech, Top Express, Vickers Shipbuilders and Engineering, Apollo Computers, University of Salford, and Thurnall Engineering.

The ARRC is made up of two companies: Advanced Robotics Research (ARRL), which will perform generic research and pass its patents along to Advanced Robotics Research Technology (ARRTL) for commercial exploitation, by way of license agreements with the cooperating organizations and other entities. The cooperating organizations are committed to subscribe shares of the society and to name directors for the two companies. A president, an R&D director, and an administrative board are to be named within the next 6 months.

DTI (Lord Young, Secretary of State for Trade and Industry)—1 Victoria Street, London SW1H OET, England. Phone: 01.215.4467/6.

LASERS, SENSORS, OPTICS

Danish Researchers Develop Neodymium Fiber Optic Laser

36980039 Copenhagen BERLINGSKE TIDENDE in Danish 13 Oct 88 Section 2, p 16

[Unattributed article: "First Danish Fiber Optic Laser"]

[Excerpts] The first completely Danish fiber optic laser has been called "an interesting alternative" to the optical components currently employed in optic cables. The laser is a 0.1 mm thin glass fiber which uses the rare-earth element neodymium. The fibers are being developed at the Arhus Research Park by a group under the leadership of Jydsk Telefon's Kristen Dybdal, and are produced by Lycom in Copenhagen. The new fiber laser emits light at a wavelength of 1080 nanometers, but neodymium can be easily replaced with erbium, which yields light at a wavelength of 1550 nanometers. The current method for amplifying optical signals is complicated and expensive. This is not the case with the new laser, maintains Dybdal. The light can be amplified directly, without using complicated electronics.

France's ONERA Develops Optical Computer

3698A346 Paris FRENCH TECHNOLOGY SURVEY in English Jul-Aug 88 p 8

[Article entitled "Optical Computer for Synthetic Antenna and Pulse Radar"]

[Text] ONERA [French Bureau of Aerospace Research] has just developed an optical computer for its Synthetic Antenna and Pulse Radar. This is the radar used at the Mediterranean Test Centre. It comprises 25 antennae installed over a circumference of 400 meters diameter, thereby resulting in a network that has a high vacancy effect, such as in a synthetic antenna. Each antenna emits a specific coded signal and receives a complex signal resulting from the composition of the echoes of 25 transmissions sent from each target. All the signals received must be processed so as to extract the useful data—site, relative bearing, speed, and distance of each target.

The necessary processing capacity is very great, as the envisaged capacity for the synthetic antenna and pulse radar in service will require the processing of 10^6 complex operations per second (10,000 TCOPS). This capacity is currently beyond the scope of conventional digital

computers. It is for this reason that the ONERA designed its own optical computer to carry out the most critical part of the signal processing. This computer is comprised of 25 identical modules, each of which processes the signals from one transmitter and 25 receivers. The matrix processing in non-coherent light is carried out using transparency masks of 2500 x 2500 pixels per module. The design of the masks defines the calculation program carried out by the computer.

The module is now operational and the complete computer should be operational in 1989.

Thorn-EMI of UK Developing Optical Tape Recorder

3698A344 Newbury INFOMAT INFOBRIEF in English 12 Aug 88 p 3

[Article entitled "UK: Thorn-EMI Develops Optical Tape Recording System"]

[Text] Thorn-EMI's Central Research Laboratories are developing an optical tape recording system which should be capable of storing 100,000 Mbytes on an audio cassette-sized unit. The recorder is believed to use "digital paper" recently developed by ICI Electronics and features a single low power laser for reading data. The read laser functions at 780 nm, whereas the write laser functions at a 850 nm. Data is stored in a helical pattern across the tape, and the tape travels round the head at approximately 30-300 nm/s.

MICROELECTRONICS

SGS-Thomson Wants United States Barred From JESSI Program

36980016 Rotterdam NRC HANDELSBLAD in Dutch 13 Sep 88 p 15

[Article by Eefke Smit: "Thomson Does Not Want United States in Chip Project"]

[Text] Paris, 13 September—American companies should not be allowed to join the new "JESSI" of Philips, Siemens, and SGS-Thomson. After all, European companies have been refused participation in comparable American technology programs.

Such is the opinion of the French-Italian chip company, SGS-Thomson. Lately the firm has tried very hard to join the American chip program 'Sematech.'

SGS-Thomson is the largest chip company in Europe after Philips. For a while it looked like it was also going to be kept out of the European program by opposition from Siemens of Germany. At the same time SGS-Thomson tried to join the comparable American program Sematech.

Those American contacts are still alive. But the chairman of the Italian-French combination, Pasquale Pistorio, said yesterday at a press conference in Paris that he has "little hope and certainly no indication" that something will come of it in the United States. Therefore, at present he prefers JESSI.

Besides, the participation of the French-Italian combination in the new chip program of Philips and Siemens has been confirmed as almost certain, Pistorio said in the lobby. In about a month or so, the three largest European chip companies will make a joint announcement on how the duties will be divided in the European project, which is going to cost billions. Equal participation in all parts of the program is no longer an issue, Pistorio said. But the French-Italian company is not prepared—now that it is allowed to participate—to make room for American participants.

The Ministry of Economic Affairs in The Hague, which would like to support the chip project over the next 7 years with an amount of between 300 and 500 million guilders, has, up to now, not prohibited American subsidiaries from participating. The ministry is, together with Philips, looking for companies in the Netherlands which can contribute parts—new materials and chip applications—to the project which is going to cost billions. Several of the 30 companies, based in the Netherlands, with which talks are going on at present, are of American origin.

IBM-Europe also appeared to be interested, particularly where the development of a European microprocessor—the control chip of every computer—is concerned. SGS-Thomson considers it to be logical, however, that the main part of the program (manufacturing technology for new chips) remains limited to Philips, Siemens and SGS-Thomson themselves.

"Ideally the three big companies should not go against one another and technology programs should be open to everyone," Pistorio's second-in-command, Vice Chairman Philippe Geyres, says in a brief interview. He points to the fact that there is no "European" identity in the chip industry but that worldwide companies do the job by definition.

Free Trade

"The best criterion for participation in technology programs is to make them accessible for everyone who adheres to the principles of free trade," Geyres says. In the same breath he points, with some regret, to the U.S. trade restrictions for chips, and the refusal to admit Philips or SGS-Thomson to the American technology program.

He regrets it sincerely because, according to Geyres, the Americans and the Europeans are both faced with the same threat: Japan. That is exactly why both the American and the European project are aimed at manufacturing technology, i.e., the reason why the Japanese are winning the chip war.

In spite of his anti-Japanese sentiments, this same Geyres is trying to establish an alliance between SGS-Thomson and a Japanese firm. Studies have shown that the weakest point of the Italian-French combination is the absence on the Japanese market. Geyres is currently having talks with six Japanese companies, he says.

SGS-Thomson has the most to offer to a Japanese manufacturer of equipment, which does not make chips itself, like Sony (consumer electronics) or Epson (printers). If such companies start to use French-Italian chips in their European operations, they will be able to comply with the EC rules, i.e., more than 40 percent of the parts has to come from local suppliers. Vice versa, those companies can give SGS-Thomson access to the Japanese market.

SGS-Thomson—starting up last year from a merger between the two chip subsidiaries of the French government firm Thomson and the Italian government firm Stet—made, for the first time, a small profit of half a million dollars over the past quarter. The profit increase was mainly the result of the strong growth of the chip market (almost 30 percent) but the firm itself interprets the favorable development "as a rejection of the pessimistic predictions that the merger would result in market losses."

This year the sales will increase to more than $1 billion but there will still be a small loss viewed over the entire year. Last year the losses amounted to $200 million. Another $200 million were written off for the reorganization in connection with the merger.

Italy: Automatic E-Beam Testing for ESPRIT Projects

3698m524 Turin CSELT TECHNICAL REPORTS in English No 5, Aug 88 pp 483-486

[Scientific paper by M. Cocito and M. Melgara, CSELT, Torino. The paper was presented at the "Ist European Conference on Electron and Optical Beam Testing of Integrated Circuits," Grenoble, France, December 1987. The research was carried out within ESPRIT Project 271, ADVICE: Automatic Design Validation of Integrated Circuit using E-beams, partially funded by the EC, with the following contractors: CSELT, Italy; BTRL, UK; CNET and IMAG, France; and Trinity College, Ireland]

[Excerpts] The usefulness of electron beam equipment in VLSI validation has been over-stressed. Only recently, however, has the necessity of a full integration between the CAD [Computer Aided Design] and E-Beam worlds been felt. The next step is the complete automation of an E-beam debugging procedure. This paper presents a description of an integrated E-beam debugging system, developed under ESPRIT Project 271.

1. Introduction

The ADVICE project seeks to develop a methodology for automatic design error diagnosis using an electron beam. The project, partially funded by the EC under ESPRIT, involves the cooperation of three industrial partners (BTRL, UK; CNET, France; and CSELT, Italy) and two universities (IMAG in Grenoble, France and Trinity College in Dublin, Ireland).

The project started in November 1984 and will end in December 1989. The total manpower is 50 man/years and the expected total cost is ECU 2 million.

The complexity of current VLSI chips demands powerful tools for detecting possible design errors. This problem is made more difficult by two additional points. The information available at the external pins is a small percentage of the information manipulated on the chip. The physical dimension of the internal lines makes mechanical probing impossible without both modifying the capacitance level and destroying the interconnections.

The adoption of an E-beam allows these problems to be overcome, enormously increasing the internal observability. However, other problems arise, related to:

— the time required to position the beam and to acquire the measure;
— the debugging strategy to minimize the number of test patterns to be generated and the number of measures;
— the techniques used to isolate the design problems.

The ADVICE project aims at providing the design/test engineer with an interactive environment integrated with the design environment so that all debugging procedures can be carried out in a computer assisted way.

A key point of the project is the integration between design and test environment.

Design data is used to make the debugging process as automatic as possible: identification of physical coordinates on the chip starting both from layout information and line names used in high level description, layout pattern recognition to perform accurate positioning, comparison of physical measures against simulation results, and so on.

To achieve this goal the project intends to develop a user-friendly working environment which places all information related to the device at the designers fingertips, such as layout information, netlists, simulation-/measure results, and fault dictionary.

The ADVICE project was divided into two distinct but subsequent research periods.

The first phase, the first two years, was mainly devoted to the assessment of the equipment together with all basic software tools to achieve a sort of partial automation of the operating procedures.

The second phase, starting from the third year and lasting 3 years, was intended to develop a more comprehensive automatic ADVICE system, deeply integrated with the CAD environment, taking advantage of the previously obtained results.

French Firm Develops Laser Plotters, CAD Software

36980041a Paris L'USINE NOUVELLE in French 29 Sep 88 pp 60-61

[Article by Thierry Lucas: "CAD/CAM: Secmai's Challenge"]

[Text]

Technological innovations and multiple alliances enable the only French specialist of computer-aided integrated-circuit design to challenge the Americans on the world market.

To establish itself on the world market, next to the American giants, such is the challenge taken up by Secmai, the only French specialist of CAD/CAM for integrated circuits. For this small to medium-size business employing 90 people (1988 sales: Fr55 million), it is a difficult battle. It will require technological innovation and multiple alliances. A strategy that was confirmed this week by a series of important announcements concerning the company's two product lines: laser photoplotters and the SPCB CAD software program designed to lay out electronic circuits on printed circuit boards.

The hardware is a new machine which can plot films with three different resolutions: 1,000, 2,000 and 4,000 lines per inch, whereas the two previous generations would allow for only two precision ranges. Thus, a single machine will be able to handle all printed circuit categories.

As for the SPCB software, it will now be geared to the Ingres relational database, thanks to an agreement signed with Relational Technology. Ingres, which will be the only database of the system, will enable engineers working on the same project to exchange data. The system will also promote CAD integration in industrial data processing, as it will allow the retrieval of data concerning inventories, parts lists, catalogs, etc., from the rest of the company's data-processing systems.

Another agreement, with Philips, involves the marketing of electronic CAD solutions using the Secmai software. To develop its own technologies, Secmai must invest 20 percent of its sales in research and development.

"Under these conditions, we cannot maintain a large sales network of our own," Francois Orth, Secmai chief executive officer, explained. The products are therefore sold through an increasing number of distributors and manufacturers, progressively set up throughout Europe. Currently, agreements are being negotiated in Japan and in the United States where Secmai has already installed 70 CAD systems. Apollo, the workstation manufacturer uses Secmai software for its internal developments. Also, the SPCB system has been running on Apollo stations since 1983.

Since the goal is to multiply cooperation, why not cooperate with the users themselves? That is what Secmai is doing: it is developing new versions of its products in partnership with the targeted users who "sign" their agreement when the product is introduced.

France's Riber, Thomson Develop GaAs Wafer Machine

36980006b Paris L'USINE NOUVELLE in French 13 Jul 88 p 35

[Article by Alain Dieul: "Riber-Thomson Together on GaAs"]

[Text] Riber is about to "make a big hit." A new GaAs wafer machine developed jointly with Thomson will slash GaAs prices.

To work ever faster, chips will use another support. Gallium arsenide (GaAs) will progressively replace silicon, which is six times slower. Some may think that this statement is premature, but Riber (a subsidiary of Instruments SA) and the Thomson-CSF central research laboratory (LCR) are not of that opinion. They just signed an agreement to develop a machine that will manufacture GaAs wafers.

Based on a new concept, the MCE (molecular chemical epitaxy) system will "slash" the very high prices of GaAs. "Scheduled for 1990, the first machine sold will deposit the thin films constitutive of integrated circuits at such a rate that production costs will be reduced to competitive levels," we were told by Pierre Bouchaib, head of the advanced materials division of Riber.

Competing with U.S. giants like Varian and Perkin-Elmer, this small to medium-size business of the Hauts-de-Seine employs 224 people and has established its reputation with the largest electronics laboratories worldwide. With a 43-percent market share, Riber is the leading manufacturer of molecular beam epitaxy machines, the least of which will cost Fr5 million, and the technology used is currently one of the only two key methods to manufacture GaAs. The other method, MOCVD (molecular oxidation [sic; actually: metal-organic] chemical vapor deposition), uses toxic gases which are very difficult to handle.

Both methods are commonly used in laboratories and offer complementary performance characteristics. The new CBE [chemical beam epitaxy] system uses known principles which the Riber machines have mastered. The materials to be deposited, instead of being presented in solid form as was the case until now, are replaced by gases. The amounts used, however, are 500 times smaller, so that the safety systems required are simpler. Using gases and an ultra-high-speed shutter, the amount of material deposited on the GaAs wafer can be controlled practically to within one atom.

Starting with the prototype set into service at the LCR in Corbeville, the objective is to develop a production machine. Riber development engineers will rely on the advice of Thomson researchers who, for their part, have reached the highest level worldwide in MOCVD.

Pierre Bouchaib expects the new machine to be "a big hit." Already, Fujitsu has bought a CBE system to manufacture the GaAs integrated circuits of its future supercomputers... That should give the Thomson-CSF management something to think about: having given up on photorepeaters and sold their former Cameca subsidiary, they are no longer geared to the production of semiconductor machines.

Photo Caption

1. p.35. Prototype installed by Riber at Corbeville. The clean rooms and other facilities were financed by Thomson.

Philips Lacks Market for 1-Megabit SRAM

Megaproject Reported in Financial Straits

36980020 Rotterdam NRC HANDELSBLAD in Dutch 11 Oct 88 p 1

[Article by Dick Wittenberg: "Major Financial Setback Threatens Philips Chip Project"]

[Text] Eindhoven, 11 Oct—The Megaproject, the cooperative venture between Philips and Siemens to develop a new generation of memory chips, is threatening to turn into a major financial setback for Philips.

Startup losses will be hundreds of millions of guilders higher than predicted. Philips is also experiencing major technological problems in controlling the process.

A Philips spokesman said that startup losses are common with projects such as this one. He refused to confirm or deny that these losses will turn out to be much higher than was initially estimated.

The extra startup losses come from the fact that the market for the Philips 1-megabit static RAM is developing much later and much more slowly than the company anticipated.

This means that the test factory in Eindhoven where the mass production is scheduled to get under way next year will easily be able to handle demand until the early 1990s on its own. For the time being, no megabit chips will be produced at the enormous factory in Nijmegen that Philips built specially for the manufacture of RAMs. Thus, for the next few years, the factory—which required an total investment of approximately 600 million guilders, will only cost money. The construction of a factory for megabit chips in Hamburg has been postponed indefinitely.

According to the Philips spokesman, all chip manufacturers misjudged market developments. He says that the demand for RAMs was assessed much too optimistically by everyone.

Prof Dr J.M Middelhoek expects that it could be 1990 or 1991 before a substantial market begins to develop for the 1-megabit SRAM. This means that the factory in Nijmegen will probably not be able to work at full capacity until 1992. Middelhoek is special professor for electronic technology at the University of Twente and a member of the international supervisory commission that reports to the German and Dutch governments on the Megaproject.

In the meantime, Philips is looking into whether the Nijmegen factory can be used for the production of other chips. The company is considering using Nijmegen to make current-generation RAMs (256 K, containing around 256,000 memory elements).

Setbacks Affect Siemens Less

36980020 Rotterdam NRC HANDELSBLAD in Dutch 11 Oct 88 p 12

[Text] Eindhoven, 11 Oct—The Ministry of Economic Affairs refuses to comment on developments surrounding the Megaproject. The Dutch government's share in the Megaproject is some 200 million guilders. Total investment in the project, including what has been put into the factories, amounts to approximately 4 billion guilders.

In the project, which involves cooperation between Philips and Siemens to develop a new generation of memory chips, Philips is wrestling not only with financial problems, but also with technical difficulties. Part of the production equipment was made available too late. In addition, the company is still experiencing great difficulty in getting certain parts of the production process under control.

According to Prof Dr J.M. Middelhoek, member of the supervisory commission that reports to the Dutch government on the Megaproject, Philips has "made it difficult for itself technologically." He says that Philips decided on a more advanced, high-quality RAM than the

competition, but that this also involves risks. "It is very difficult to close the gap and move directly into the number one position. Philips is working at the limits of technical know-how."

A Philips spokesman says that the Megaproject is not experiencing any insurmountable technical problems.

Within the Megaproject, Siemens has not focused on the 1-megabit static RAM chosen by Philips, but rather on the 4-megabit dynamic RAM. The market for DRAMs always moves faster than the market for SRAMs of the same generation. Because of this, Siemens will suffer much less from more sluggish market developments. In addition, Siemens is already producing DRAMs of the current generation, in Regensburg. These are 1- megabit DRAMs, of which there is a major shortage at the moment.

Philips Defends Project

36980020 Rotterdam NRC HANDELSBLAD in Dutch 13 Oct 88 p 17

[Excerpts] Rotterdam, 13 Oct—Philips flatly denies that there is the threat of a financial setback in the Megaproject, the cooperative venture with Siemens in developing a new generation of memory chips.

According to the company, getting new manufacturing processes under way always results in high startup costs. These costs have been taken into account in the Megaproject, says Philips.

This was the firm's reaction to Tuesday's report in this newspaper concerning the startup losses that will turn out to be hundreds of millions of guilders higher than anticipated.

Philips confirms that the new generation of chips (1-megabit static RAMs) will not be going into mass production for the time being. Instead, the production of the current generation of chips (256-kilobit static RAMs) will be started up in mid-1989 at the test factory in Eindhoven. Use will be made there of the technology that has been developed for the new generation of chips.

In order to gain production experience more rapidly, Philips has raised the capacity of the test factory in Eindhoven by 50 percent. The plant has recently been in continuous operation 7 days a week. Once the test factory has the production process under control, the process will be transferred to the automated plant in Nijmegen. According to Philips, a plan has been drawn up for this that is on schedule. Once the market is ready, Philips will begin mass production of the new generation of chips.

Philips Delays 1-Megabit Chip Production

36980071 Vienna DIE PRESSE in German 11 Nov 88 Supplement p 8

[Article by Helmut Hetzel: "A Step Backwards: Philips Postpones Chip Production"]

[Text] Philips Gloeilampenfabrieken N. V. is postponing the startup of production for the 1-megabit chip, which was originally scheduled for 1989. In addition, the Dutch electronics company will not begin mass production of the 1-megabit chip at three plants in Hamburg, Nijmegen and Eindhoven in 1989, as originally planned. In Eindhoven alone, production should begin around the middle of next year.

The new factory in Nijmegen, built specially for megabit production at an expense of around 600 million guilders in investment and research, will reportedly supply "smaller chips" in the future. And the construction of a similar chip factory in Hamburg has been put off for the time being.

According to Philips spokesman Han Waalwijk, a decision will not be made "on the construction of the 1-megabit chip factory in Hamburg" until next year. However, Waalwijk denied Dutch press reports claiming that construction of the facility in Hamburg, in which Philips has already invested DM 75 million, is doubtful. He said that only the decision about when the Hamburg chip factory will go into operation has been postponed until 1989.

The development and mass production of this "superchip" was realized jointly by Philips and Siemens, and given DM 300 million in subsidies by Bonn, as well as 200 million guilders by The Hague. The primary goal of the project is to gain access to the know-how for this 1-megabit chip, and thus to not be dependent on Asian—primarily Japanese—suppliers.

As a next step, Philips and Siemens wanted to jointly see to it that the market for chips is not left entirely in the hands of the Asian competition, by producing them in mass. Philips and Siemens have invested a total of some 3.4 billion guilders in the development of their joint megabit project.

Philips' surrender, which is described in Dutch economic and financial circles as "surprising," is explained as being due to the fact that growth in this chip market will clearly decline over the next few years. A recently published study by the American "Semiconductor Industry Association" is cited in this regard; according to it, a recession can be expected in this sector in the years ahead. While the rate of growth this year was around 38 percent, the study says, it will drop to an anticipated 10 percent in 1989. Stagnation can be expected on this market as early as 1990, the study says.

It appears that Philips has adopted this pessimistic analysis by the American semiconductor industry, and is drawing the corresponding conclusions. Nevertheless, the decision by Philips management to postpone the startup of production of the 1-megabit chip has provoked a torrent of speculation. In Amsterdam financial circles, the possibility that Philips is not yet technically able to mass produce the 1-megabit chip is not being ruled out.

Because of these and other rumors, Philips is under pressure on the stock market, since leading Dutch computer experts point out that the pacesetting Japanese competition is clearly increasing its investments in mass production of the 1-megabit chip this year, and that the Korean chip manufacturer Samsung also recently indicated that it wants to invest the equivalent of a billion guilders in the construction of a new 4-megabit factory.

Experts also note that it generally takes 2 to 3 years for the technically costly and complicated mass production of the 1-megabit chip to get under way.

For Philips, this would mean that the company would scarcely be able to make it onto the market with its 1-megabit chip by 1992. However, should the prognosis of the Americans concerning the upcoming chip recession be wrong, or should the market quickly change and begin advancing, then it could be "too late" for Philips to take any share of the market, according to experts. It is possible that Japanese, Korean and American chip manufacturers could have developed their market positions to such an extent that Philips would have difficulty getting anywhere on the market with its own 1-megabit chip. Worldwide sales on the chip market for this year is estimated at $45 billion.

NUCLEAR ENGINEERING

EC Commission Proposes Teleman Robotics Program

3698A341 Brussels EC INFORMATION MEMO in English No P-95, 19 Jul 88 pp 1-2

[Report entitled "Research Into Remote Handling in the Nuclear Industry: the Teleman Programme"]

[Text] There is considerable potential for the use of teleoperators in the nuclear industry to improve the separation of workers from radioactive equipment, thereby enhancing nuclear safety, while at the same time benefitting from gains in productivity in nuclear plant repair and maintenance operations. The same technology will also be of use in other very hazardous environments.

The Commission has proposed a new five-year cost-shared research activity, known as the Teleman programme, whose aim is to strengthen the scientific and engineering bases used for the design of nuclear remote-handling equipment. The cost of Teleman will be approximately 40 million ECU. The proposed Community contribution is 19 million ECU, and the programme will run from 1989 to 1993.

Applications for remotely-operated equipment exist at all stages of the nuclear fuel cycle from uranium mining to nuclear fuel reprocessing, and especially in reactor operations such as inspection, repair and maintenance, decommissioning and emergency response.

The technology to be developed for application by industry is computer-assisted teleoperation delivered by machines with appropriate degrees of autonomy at a distance from its operator, that is, with some robotic characteristics. The teleoperators of interest are mechanical arms to which a variety of tools and sensors can be attached, manipulators attached to moveable gantrys and partially-autonomous vehicles equipped for specialised jobs. Although there is considerable overlap with developments in industrial robotics, the environments in which these machines must work place additional demands on the technology.

At present the safety inspections of nuclear plants are subject to constraints relating to the need to minimise each inspector's exposure to radiation. The Commission wants to have these constraints eliminated as far as possible by removing human beings from the inspected area. This should also help to reduce the costs and wastes arising from the use of special equipment required to protect operators engaged in maintenance and decommissioning operations.

The Commission also wants to encourage the development of equipment that will enable plant operators and public authorities to deal more effectively with accidents and other unusual events.

Teleman will address basic problems associated with remote operations using computer-assisted teleoperators with increasing degrees of autonomy, questions relating to teleoperation in nuclear environments and the integration of the disciplines that make up robotics.

To serve the maximum number of nuclear industry users and entrepreneurs and minimise the risks associated with a rapidly evolving market, Teleman will invest most of its resources in the provision of generic building blocks for incorporation in a variety of specialised machines. These sub-system technologies in turn could then be used by industry in ways that cannot all be foreseen today.

Teleman will demonstrate its research products by incorporating them into research machines that exist or are under development in the laboratories of its contractors. Analysis of the behaviour of research machines will show how machines will need to evolve to meet commercial

demands and thus lay the groundwork for product development and demonstration programmes to be executed outside Teleman by industry in a competitive environment.

The technical content of the programme is divided into four areas: teleoperator component and sub-system development; environmental tolerance; research machine projects, and product evaluation and studies.

Implementation of the projects shall be through cost-shared research and development actions, concerted actions, studies and coordination activities. Training-/mobility grants shall be included to facilitate the assembly of relevant skills at appropriate locations for the work of the projects and to promote effective diffusion of knowledge.

The Community's participation in shared-cost research contracts will not exceed 50 percent. Preference will be given to projects in which industry, universities and research organisations from Community countries collaborate and with participants coming from more than one member state.

Remote handling is a technology that contributes to the safety of many parts of a nuclear industry that currently supplies the Community with more than 35 percent of its electricity. Its importance is unlikely to be reduced by the introduction of new types of reactor, since there will always be components exposed to radioactivity that are in need of inspection, maintenance or repair. Meanwhile, the Community's nuclear installations continue to age, and demands for safety inspections continue to increase.

While fuel fabrication, reprocessing and inspection are increasingly automated, provision still has to be made for dealing with breakdowns, leaks, component failures, new demands such as decommissioning and response to less structured events such as on-site emergencies in all types of nuclear plant. In these circumstances, teleoperators having some of the flexibility of human beings without their sensitivity to radiation come into their own.

Cadarache Center Develops Superconducting Tokamak

3698A345 Paris FRENCH TECHNOLOGY SURVEY in English Jul-Aug 88 p 3

[Article entitled "A Tokamak Named TORE SUPRA"]

[Text] As part of the European fusion program, the Department of Controlled Fusion at the Cadarache Nuclear Research Centre has just developed a superconducting magnet tokamak. This machine, called TORE SUPRA, is of imposing dimension (large plasma radius of 2.25 meters, small plasma radius of 0.70 meter, weight of the superconducting magnets: 45 tonnes, plasma current 1.7 MA). It has been designed to study new plasma heating methods and long-duration discharges. The tore magnetic field is made using superconducting coils. The superconducting material used is NbTi [Titanium Niobate] cooled with superfluid helium. TORE SUPRA recently produced its first plasma. It is the biggest tokamak superconductor in operation in the world. It should be noted that two major international projects are currently being examined: NET [Next European Torus] and INTOR [International Torus]. The joint aim in these projects is to install a machine that will lead to the concept of a fusion reactor.

SCIENCE & TECHNOLOGY POLICY

FRG-USSR S&T Cooperation Treaty Detailed

AU2710150988 Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 26 Oct 88 p 2

[Article by "C.G.": "Several Agreements Signed"]

[Excerpts] The FRG-USSR "Treaty on Scientific-Technological Cooperation in the Field of Research and the Peaceful Use of Space" will be added to existing agreements in this sphere—on the peaceful use of nuclear energy, public health, and agricultural research. The latter agreements are combined in the skeleton agreement on scientific-technological cooperation which was signed in 1986. The negotiations on the space agreement were led by the FRG Research Ministry and the USSR Academy of Sciences. Since technical and financial questions concerning the proposed individual projects have yet to be settled, an implementing program has not been concluded so far. The agreement will be put into force only after a list of projects is agreed upon.

The space agreement names fields of cooperation: Investigation of solar-terrestrial relations; space astronomy and astrophysics; exploration of the solar system, planets, and comets; exploration of the atmosphere and earth from space; basic research in the field of zero-gravity; space biology, and space medicine. The inclusion of additional fields is to be agreed upon from time to time. The participation of a German astronaut in a USSR space mission falls under scientific-technological cooperation. Article 3 of the treaty contains the following passage: "This agreement confirms the participation of a specialist of the other side in a mission with a Soviet space ship and a Soviet space station, an agreement which has already been agreed upon between the responsible authorities in the FRG and USSR. The conditions for carrying out this mission will be agreed upon separately by the responsible FRG and USSR authorities." This article gave rise to difficulties up to the very last moment, because the original USSR formulation permitted an interpretation according to which citizens from Berlin would—at least theoretically—be excluded from the circle of potential candidates for such a mission.

The agreement provides for a joint experts group. One of the articles stipulates: "Each side is responsible for the cost of its work within the agreement. The agreement is

not valid for projects that are carried out on a commercial basis. It lays down regulations concerning the supply of information and data, as well as concerning liability and medical assistance for scientists and experts within the exchange program. According to the usual "Frank-Falin Clause," the agreement will be extended to include Berlin. It will be valid for 5 years, and, if it is not terminated after that, its validity will be unlimited. According to the agreement, the use of services of one partner is not to be paid for with money but by exchanging performances in kind on a cooperative basis.

The "joint declaration on cooperation to achieve higher temperatures for cooling agents in high-temperature reactors by the FRG minister for research and technology and the USSR state committee for the use of nuclear energy" is to be accompanied by an agreement of FRG firms with the USSR. A high-temperature reactor, which will be built in the USSR, is to be further developed in order to attain a higher level heat source for industrial use. A joint research and development program is being considered for this future project. Such state-subsidized research cooperation is to be carried out in accordance with the implementation of corresponding contracts with industry, but only when industrial supply and payment obligations are being met. The cost for the future high-temperature research will have to be borne by the corresponding FRG and USSR agencies. Research Minister Riesenhuber wants to keep expenditure low. It is not clear yet to what extent this expenditure will be met from the annual medium-term total of DM35 million which has been designated to accompany research on the high-temperature reactor, or from a budget item that would have to be newly created. The Moscow declaration means that the research project is to be included in the implementing programs on the FRG-USSR nuclear agreement.

The agreement on the safety of nuclear technology and radiation protection is made up of two parts. Part one refers to the implementation of the regulations of the 1986 Vienna Treaty—following Chernobyl—on early information in the case of nuclear accidents. Article 2 states: "In case of any accident in connection with nuclear installations on the territory of one side..., in the course of which radioactive matter is released or may be released to the territory of the other side, which may be of concern from the point of view of radiation safety, the first side will immediately and directly inform the other side about the incident and provide all available information." Notice has also to be given whenever extraordinarily high radiation is identified—which has come from elsewhere—and may have consequences for the receiver of such information. Part two of the agreement refers to the exchange of information and experience with regard to the safe operation of nuclear plants. This applies particularly to the exchange of technological information on the assessment of possible consequences of an accident and to the drawing up of the decisions which have to be made in order to protect the population and the environment. Appropriate information has to be handed over at least once a year. A list of nuclear installations, including the characteristics and volume of the information to be conveyed, has to be established in mutual agreement by exchange of notes. Consultations concerning the data that have been passed on and concerning questions of international cooperation must take place at least every other year.

EC Commission Proposes Monitor Program

3698A343 Brussels EC INFORMATION MEMO in English No P-97, 19 Jul 88 pp 1-2

[Article entitled "Monitor: A Program of Strategic Analysis, Forecasting and Assessment in Matters of Research and Technology"]

[Text] The Commission has just adopted a proposal for a Community research program on strategic analysis, forecasting and assessment in research and technology, known as Monitor.

The Monitor program covers three fields of action closely connected and complementary in function:

- Strategic and impact analyses relating to scientific and technological developments—SAST [Strategic Analyses in the field of Science and Technology],
- Forecasting—FAST [Forecasting and Assessment in Science and Technology],
- Research and studies aimed at improving methodologies and effectiveness of the evaluation of research and technological development—SPEAR [Support Program for a European Assessment of Research].

Monitor is planned to cover the period 1988-92 with a total budget of 22 million ECU.

In our advanced industrial societies, research in general and public-sector research in particular are inseparable from the performance of a number of functions without which they cannot be fully effective: scientific and technical monitoring, consisting of detecting practices emerging in laboratories and companies; strategic and impact analysis, highlighting the medium-term effects of scientific and technical developments; long-term forecasting of the main trends in science and technology; and the evaluation of the projects and programs undertaken.

This principle, which is of general application—as illustrated by the work done in the United States by bodies such as the National Research Council or the Office of Technological Assessment—applies in particular to Community research and technological development work, which aims to make specific and complementary contributions to national initiatives in Europe.

The Commission therefore proposes that all these functions be provided under an integrated system closely linking various Community activities and developing networks to coordinate them with similar work in the member states.

The scientific monitoring function would thus be provided by various competent scientific bodies, notably the technological institutes of the Joint Research Centre, where the activities concerned will benefit from a proper scientific and technical support environment.

The other three functions should be handled by the Monitor program, under its three parts SAST, FAST and SPEAR.

SAST activities will consist of analyses targeted on a field of science, a technology, a sector or a critical theme. They will comprise:

- Writing of reports on the strengths and weaknesses of part or all of the Community in a high-technology area, a field of science, etc.;
- "Technological assessment" studies on the state of development of a technology and its future development, obstacles to innovation, industrial and socio-economic impact, etc.;
- Writing of strategic analysis reports (or strategic dossiers) highlighting the options open to the Community for a given problem.

FAST activities will resemble previous FAST work, the ESPRIT programs and certain aspects of Community biotechnology work partly emerged from FAST. They will comprise:

- Writing of reports (or forecasting dossiers) on major themes or phenomena of a general nature (scientific development and social cohesion, internationalization of technology, alternative possible futures for the main regions of the world, etc.);
- Studies of the implications of certain scientific and technical developments (technology and health, technology and equality of opportunity, etc.);
- Reviews and critical analyses of the results of the principal forecasting studies published worldwide;
- Writing biennal reports on the economic and social implications of technological change.

SPEAR will provide support for the assessment of Community programs, systematically carried out by independent experts. It will comprise comparative analyses of the major Community, national and international programs and research on methodologies for assessing research and technological development programs, including the development of quantitative indicators.

EC Approves R&D Projects for Esprit-II

36980022b Paris ELECTRONIQUE ACTUALITES in French 9 Sep 88 p 3

[Article signed R. F.: "Fr12 Billion; EEC: New Electronics R&D Projects"]

[Text] During the summer, the EEC selected the first 158 projects of Esprit-II [European Strategic Programs for Research and Development in Information Technology]. It also launched three new community programs on electronics and data processing applications: Drive (road safety systems), Delta (application of new technologies to teaching), and a program designed to promote professional electronic information services in Europe.

Following the first invitation to submit proposals for Esprit-II (the deadline was April 1988), the Brussels Commission received 650 proposals: 158 were adopted. They represent a total budget of 1,560 million ECU [European accounting units] (Fr10.7 billion); 780 million ECU will be provided by the EEC, the rest by project participants.

Note that this budget of 1,560 million ECU represents one half of the total budget (3,200 million ECU) allocated to Esprit-II as a whole.

Of the 158 projects, 30 percent deal with microelectronics and peripherals, 30 percent with data processing systems, and 20 percent each with computer-integrated manufacturing and office automation.

Small and medium-size businesses will participate in 148 of the 158 projects.

The first project contracts will be signed this fall. The precompetitive R&D themes covered by the 158 first projects involve in particular "household automation" [la domotique], software certification, ASICs [application-specific integrated circuits] (especially those designed for consumers), very-high-speed bipolar integrated circuits, non-volatile memory cells, high-performance parallel computers, voice-equipped workstations, data, writing and graphics.

Something new, compared with the first Esprit program: Esprit-II will include a number of basic research projects on information technologies. The deadline to answer the first invitation to submit proposals was in June. Brussels received 300 proposals. Selection should be completed next October.

Simultaneously with Esprit-II, another program was just launched; it is designed to co-finance pilot demonstration projects in the field of electronic information services. The program will last 2 years; it has a budget of 36 million ECU. The first projects should start early in 1989. They should involve, in particular, image banks and "intelligent" interfaces, as well as applications such as road transport, tourism and patents.

The EEC has also just given the go ahead to two precompetitive R&D programs which, like Esprit, will be financed 50 percent by the EEC and 50 percent by manufacturers. The first of these programs, Drive, involves the application of information and telecommunication technologies to road safety: radar systems, sensors, transmissions (microwaves, infrared, etc.). It will

last 3 years and will have a budget of 120 million ECU, 60 million of which will come out of the EEC budget. The first Drive projects will be launched at the end of 1988.

Finally, the other new R&D program that was just created, Delta, will involve new applications of electronics to education: image processing, direct satellite TV, ISDN, artificial intelligence, etc. For the time being, a single "exploratory project" was launched; it will last 24 months and will have a budget of 40 million ECU, 20 million of which will be provided by the EEC. The first projects will be announced early in 1989.

EEC Creates Intercommunity R&D Budget

35190016z Paris LES ECHOS in French 12 Sep 88 p 8

[Article by Gilles Bridier: "First Community Budget for Research"; first three paragraphs are introduction]

[Text] Two separate but nonconflicting trends are taking shape in the European civil and military aeronautics sectors.

First, across-the-board cooperation, which has long been practiced, but which sometimes engenders penalizing rigidities in international competition and which fails to match the industrial capital base of American competitors. Second, an integration of complementary activities on a national basis (in the UK and the FRG), which will allow new groups to carry more weight in the EC bodies.

To support the emergence and competitiveness of this two-dimensional arrangement, Brussels is prepared to create a community budget for aeronautics research. This will be a first. . .particularly for those governments ceding some of their traditional authority in this sector.

Brussels is preparing a research budget in the aeronautics sector. This is a new step. Never before has the EEC been interested in this industry, despite its extreme importance as much for technology as for trade or a strategic approach. The 3-year-long deliberations of the Euromart study group (composed of nine associations[1] and under EEC contract) have finally borne fruit, although the results will still be subject to arbitration.

In any case, the results represent a changing attitude on the part of the EEC governments, which agree to relinquish some of their power over the direction of occasionally strategic activities. For even private enterprises in this sector have always and forever been tightly bound to national strategic options. As it is, a community research budget would confirm the governments' willingness to make a breakthrough in the same spirit as the one that presided over the emergence of the common market in armaments. It is true, however, that this willingness is dictated by economic motives, taking into account programs' increasingly steep development costs.

Initially, it is a matter of reacting to the U.S. Government's commitment to its manufacturers in order to reaffirm U.S. hegemony in this sector. However, it is also a question of countering the advent of new government-subsidized aeronautics industries. All this exists in a setting where the reference currency—the dollar—is held at ceiling values during all the negotiations.

The Euromart (European Cooperative Measures for Aeronautical Research and Technology) study was officially launched in February 1987. Basically favorable findings on civil aeronautics would seem to dim the prospects for the military sector. Between 1980 and 1986, the European aeronautics industry owned 23 and 28 percent of the civil and military aircraft markets respectively. This translates into a total turnover for that period of 69.5 billion ECU's (486 billion francs) and a yearly average of 9.9 billion ECU's (69 billion francs).

With the increased strength of the civil sector from 1987 to 2010, the yearly average could rise to 14.8 billion ECU's, or 117 billion francs, with a total of nearly 2,500 billion francs for the 24-year period. This increase, however, will be sustained by civil aircraft sales (32 percent of the world market), while the European aeronautics sector will suffer a 5-point drop (to 23 percent) in its share of the world market.

However, Europe must still be able to retain all its trump cards. In order for their commercial competitiveness to be based on technology, the 9 European manufacturers need well over the 370 million ECU's (nearly 2.6 billion francs) presently dispensed per year on research and technology (exclusive of development and without including engine and equipment companies). In their view, there is an urgent need to increase these kinds of expenditures by 25 percent, followed by a gradual upward trend until the present level of expenditures has been increased by at least 50 percent at the end of 5 years and by 100 percent at the end of the 1990's.

All this is very ambitious, but Karl-Heinz Narjes, vice president of the European Commission, himself provided the necessary impetus so that Euromart and its study would gain freedom of a city. A six-pronged approach involved civil and military aircraft, helicopters and V/STOL prop aircraft, and the successors to the Concorde (supersonic or hypersonic, the latter of which would be ready to fly around 2010 to 2015). This last development approach would stipulate only that there be no non-European partners. For before the successor to the Concorde sees the light of day, it will above all have to prove its commercial viability, which will involve a major apportionment of development costs.

Footnote

1. Aeritalia, Aerospatiale, Avions Marcel Dassault, British Aerospace, Casa, Dornier, Fokker, MBB, Sabca.

Overview of French Standards Organization

1988 Budget Outlined

3698M0001 Paris ENJEUX in French
No 91, Jun/Jul 88 p 18

[Financial report presented by Daniel Geronimi, director of finance and logistic support, AFNOR: "AFNOR's 1988 Budget"]

[Text]

1987 Fiscal Year

The 1987 fiscal year closed with a positive balance of Fr 1.2 million, justifying the policy of resource diversification adopted over the last few years.

While this result is a modest one, it is indicative of AFNOR's [French National Standards Institute] vitality. During the last fiscal year AFNOR pursued its program of investing in equipment for defense development, its regional committees, and its work in personnel training, while simultaneously carrying out an extensive structural reorganization.

But this result cannot guarantee that our funds will be maintained at the level necessary to finance both our investments and our increased financial requirements resulting from this level of activity.

One of our medium-term priorities will therefore be to increase our funding level. A number of actions have already been undertaken or are planned to ensure AFNOR's long-term capitalization: equipment subsidies guaranteed by the Ministry of Industry, a loan for the purchase of a new computer, more systematic research on sales margins for products and services, and finally, the possibility of requesting special funds from companies so that French standardization can meet the 1993 deadline in a good state of health compared to its major European competitors.

1988 Budget

The budget for the 1988 fiscal year, which has been increased to Fr 237.5 million from the 1987 figure of Fr 231.7 million, is a transition budget marked by AFNOR's desire to distribute its resources more effectively according to the priorities laid down by the National Council for Standards.

Additional resources will therefore be allocated for implementation of the following three priorities:

— strengthening and upgrading of services to companies;
— consolidation of the image AFNOR-standardization-certification [as published];
— adaptation by AFNOR to the changes foreseen in the European system of standards.

These priorities will require a total budget of Fr 60 million, of which Fr 12 million will be financed through the reallocation of our resources, a reduction in "non-quality" costs, and an increase in sales of our products.

In balance sheet terms of income and expenses, this development will of necessity be an extremely gradual one, and the major characteristics of the 1987 fiscal year will appear again in 1988. Sales are growing in such a way as to compensate for the fact that there has been no increase in subsidies and to ensure a balanced budget.

Resources: Sucessful Policy of Diversification

The 1987 results were achieved thanks to an increase in the products and services billed to our customers (+ 11 percent) excluding contracts and agreements. We should particularly emphasize the good performance levels achieved by technical work, microchips, and certification and training, all of which enjoyed growth rates of over 15 percent.

General Trend of AFNOR Budget Excluding V.A.T. (in millions of Fr calculated at constant 1987 value)

In 5 years the organization's resources have increased by 35.6 percent, while subsidies have increased by 15.5 percent in constant francs.

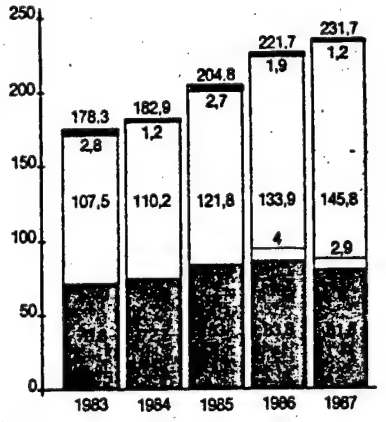
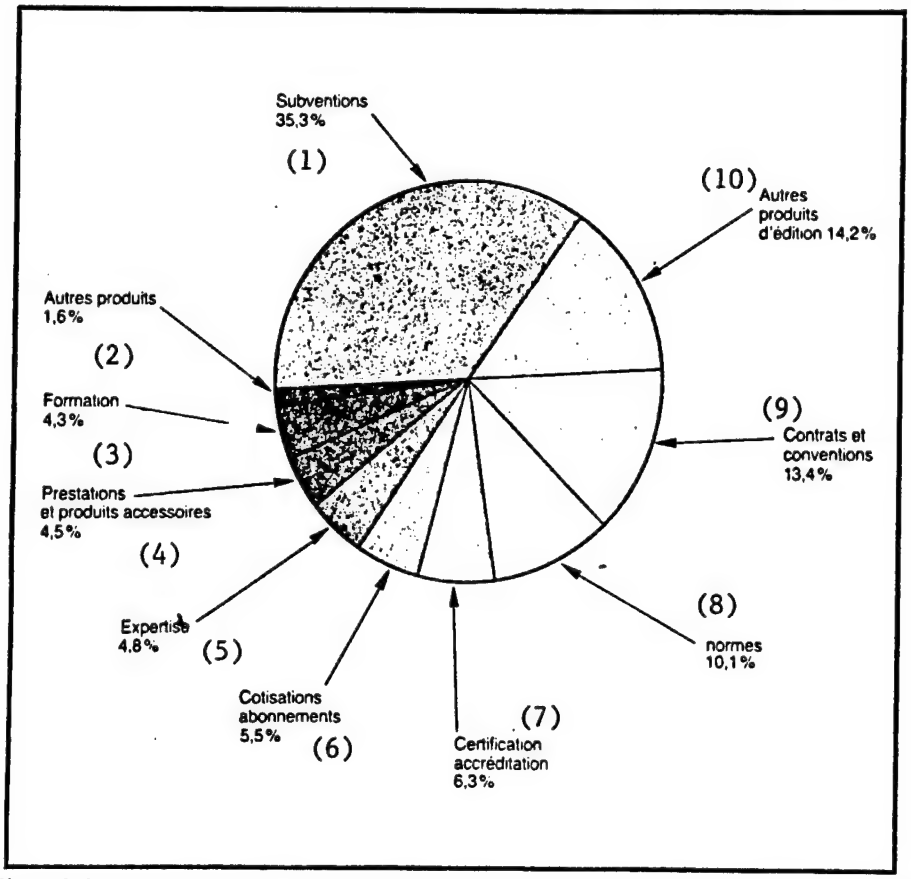


Figure 1.

Key:—1.Positive result—2.HT Resources—3.Including contracts and conventions—4.Stocks variation—5.HT Subsidies

Figure 2. The diagram shown below illustrates the highly diversified nature of our activity.



Key:—1.Subsidies—2.Other products—3.Training—4.Ancillary services and products—5.Know-how—6.Allocation for membership fees—7.Certification approval—8.Standards—9.Contracts and agreements—10.Other publications

R&D Industrial Standards Outlined

3698m001 Paris ENJEUX in French
No 91, Jun/Jul 88 pp 29-32

[Interview with Michel Lavalou, head of the working group "Applied Research and Standardization" and president of the Technological University at Compiegne: "Standards From the Researcher's Point of View;" date not given.]

[Excerpts]

ENJEUX: After having appointed a science and technology adviser—Antoine Thiard—to serve the director general, AFNOR [French National Standards Institute] decided to establish a working group, "Applied Research and Standardization," which you head. The combination of applied research and standards is something totally new within the context of the links between research and industry. Is this finally an acknowledgement that standardization is one of these links?

Michel Lavalou: Standardization is increasingly necessary if we are to respond to the challenges facing companies. This is why we have to look for new approaches, the creation of standards that will help to provide the most effective support for our industry. This was the reason why the National Council for Standards and AFNOR's board of directors decided to create the "Applied Research and Standardization" group, of which AFNOR has done me the honor of making me head.

It is true that standardization must form one of the links between researchers and companies. This link already exists in the technical centers and laboratories for applied research and testing. Through their know-how and their professional relationships, they constitute points of contact between research, industry, and standardization, with most of them making an active contribution in this respect. But there are limits to this form of collaboration. Organized links do not always exist between the work of standardization in any given sector and the research work of these bodies, either in the same sector or in related sectors.

ENJEUX: Who are the members of your working group and what direction does the head of the group intend to take?

Michel Lavalou: The group is made up of people in highly responsible positions in the fields of pure and applied research and in industry.

Our intention was for the group to have a limited number of permanent members, while at the same time leaving room to co-opt specialists in specific fields. To avoid the risk of excluding anything arbitrarily the group deliberately decided from the very beginning not to limit the scope of its activities. Several areas of study have been initiated. First, the role that standardization can play in accompanying and supporting scientific and technological development, and second, the structures, approaches, and methods of action which must be defined so standardization can be incorporated as far as possible in the research and development process. In addition to these activities, and with the aim of formulating concrete proposals as rapidly as possible, the group also decided to inititate an in-depth analysis based on three concrete examples of the standard process of definition. Several points will be examined: on the one hand, the methodology employed in the process of defining standards, and on the other hand, the stakes, the contents of the standard in relation to the real requirements and, finally, the impact of the standard on the market.

We re-examined one case which had already been examined on a previous occasion, a second case which is relevant at present, and a third case concerning the future. The first case refers to the standardization of containers and palettes, to which Pierre Ailleret dedicated a lengthy article in the April issue of ENJEUX. The second case concerns microcircuit cards, and the third one deals with new materials.

Starting with the material that we are now beginning to put together, we will soon be preparing some proposals for AFNOR's board of directors. These [proposals] will deal with training, relations within companies, ways of creating links between research laboratories and technical centers for producing standards, the technological monitoring of new technologies and new products, and the eventual creation of a permanent committee within the board of directors.

ENJEUX: Is your group going to study the introduction of standards in the research and development objectives of the European programs ESPRIT and EUREKA or of other European programs?

Michel Lavalou: Our group is currently conducting studies through the European programs—particularly EUREKA and ESPRIT, which you mentioned—to identify the ones for which the definition of standards seems to have been taken into account as part of or as a result of the studies that have been carried out. For this purpose, we have re-examined two projects to study the various aspects of the problems based on these concrete examples.

The first one concerns APEX [Advanced Project for European Information Exchange] which is part of the EUREKA program. The objective of this project, in which Aerospatiale, Aeritalia, British Aerospace, Casa, and Messerschmidt Bloekow Blom are participating, is to develop a pilot system for the exchange of information utilizing a common structure. At a later stage, this structure should be able to market the products and services created and developed for the benefit of international industrial cooperation. The participants in the program seek to make the greatest possible use of standardization as well as to contribute to its development. Within this framework, it was originally decided that the project leader, together with Aerospatiale, would draw up an inventory of the existing standards incorporating progress at the national, European, and world levels. It was also decided that work should be started on an inventory of the need for standards as demonstrated by the state of progress of the project.

The second project we have re-examined is the CNMA [Communication Network for Manufacturing Applications] project which is part of the ESPRIT program. The objective of this project is to create the necessary standardization methods at the European level to speed up the definition and utilization of communications operating standards in the field of automated manufacturing (computer integrated manufacturing, CIM) so that heterogeneous systems can be interconnected. The most interesting aspect of this project is the synergy that it creates between users and manufacturers; this synergy must be systematically pursued when defining standards. Another interesting aspect of the project is that it demonstrates that standardization is only complete when it proposes solutions—not simply for the standard itself but also for testing the standard, for the system of tests, and for certifying conformity with the standard.

The group has therefore decided to follow this work closely, particularly at the European level, through the ITSTC [Information Technologies Steering Committee] which is part of the CEN [European Standards Center], CENELEC [European Committee for Electrotechnical Standardization], the CEPT [Association of European Telephone Administrations], and which falls within the framework of ISO [International Standards Office] TC 184 "Industrial Automation Systems."

Box insert, p 30

Working Group for Applied Research and Standardization

Lavalou, director of AFNOR, head of the working group and member of the ISO consultative committee for technology orientations

Ailleret, honorary president of the UTE [Technical Association for Electricity]
Balazard, head of research, Aerospatiale
Charpentier, Department of Physical Engineering Sciences, CNRS [National Center for Scientific Research]
Denoble, assistant general controller, Study and Research Department, EDF [French Electricity Board]
Dureault, director general, CETIM [Technical Center for the Mechanical Industries]
Laffineur, director for data processing and organization, Credit Lyonnais
Cohen-Aloro, Credit Lyonnais
Lanusse-Crousse, head of the national union of suppliers of subsidiaries, supermarkets, and hypermarkets
Malaterre, national union of suppliers of subsidiaries, supermarkets, and hypermarkets
Mareschi, deputy scientific director, BSN [Broadband Switching Network]
Mentre, head of marketing, SOCOTEC [Association of Technical Construction Control]
Peres, former director general of CETIM
Ricaud, armaments engineer (CR), Defense Departments Scientific Committee.
De Robien, head of planning, BULL
Mrs Thomas, Research Department, Rhone-Poulenc
Courtier, head of quality control, AFNOR
Thiard, science and technology adviser, Department of the Director General, AFNOR
Aigrain, former minister, scientific adviser to the President of Thomson, S.A.—he is informed of the group's work.

CAD Data Library Progress

3698m003 Paris ENJEUX in French
No 91, Jun/Jul 88 pp 33-37

[Article by Eric Julliard of the Business Efficiency Department of AFNOR [French National Standards Institute]: "The French Approach to Standardization"]

[Excerpts] Our study is made up of two sections:

- The status of standardization in Europe, where the FRG, Norway, and Sweden have already begun to work with their industries on this subject and have initiated national projects;
- The state of affairs in France, where suppliers and users of CAD systems or parts banks are concerned with their products or their use—in the absence of standards for this sector, considerable individual efforts have been expended without coordination.

The two sections explain the context in which AFNOR—together with its industrial partners—is actively working to prepare a proposal for the meetings of a CEN/CENELEC working group, "CAD Standard Parts Library" (awarded a mandate from the EC Commission in Brussels to define a European standard).

This provides some initial responses to the themes which will be discussed by AFNOR on 6 and 7 September:

— Is it possible to have a single standard capable of meeting the essential needs of the major industrial sectors?
— Just how far must standardization go between CAD and libraries? At a global level, what are the limits of standards for parts libraries?

Standardization Response

A widely discussed and eagerly awaited position on standards was recently formulated in France. Before providing details, let us examine the situation concerning standards first at the international level and then at the European level.

International Scenario

The work carried out in the 1980's on the exchange of graphic data for CAD is well known. This work led to the publication of the IGES [International Graphic Exchange Specification] standard in the United States, publication of standard Z 68-300 on SET [Exchange and Transfer Standard] in France, and publication of the VDA-FS [Automobile Industry Association, surface interface] standard in the FRG.

Other work, at times more general and at other times more specific in nature, led to the creation of norms and standards—EDIF [Electronic Data Interchange Format] for electronic CAD, for example—while at the same time standards for structuring and formatting data—EDIFACT [Electronic Data Interchange Format for Administration, Commerce, and Transport] for data relating to administration, commerce, and the transportation of goods, for example—were being formulated in areas not related to CAD.

The latter work gave rise to the emergence of a global concept concerning data exchange—EDI [Electronic Data Interchange]—which can be applied to a number of sectors such as banking or travel.

In the field of CAD, work has been undertaken in the United States under the term PDES [Product Data Exchange Specification] which seeks to define a specification for the exchange of "product definition data." The most optimistic experts believe that this specification will not come into even partial use before 1990.

The formulation of international standards is not being outdone. Within the framework of the ISO [International Standards Office] /TC 184/SC 4, there is a project referred to as STEP [Standard for the Exchange of Product definition data] which is based to a great extent on the U.S. PDES project.

It is clear that international standards are not currently in a position to provide suitable answers to the problems mentioned earlier, even though some of the work being done can provide us with food for thought.

European Scenario

Here we get to the heart of the matter because it was possible to identify three projects dealing with different aspects of CAD parts libraries.

These projects, which are presented below by the respective project heads and therefore do not need to be discussed further at this point, are the following:

— in the FRG, the "CAD-Standards Collection" project under the supervision of the DIN [German Institute for Standardization];
— in Norway, the NAD [National Article Database] project under the supervision of the NVS [Royal Norwegian Science Society];
— in Sweden, the "CAD Standard Parts for Design Elements" project under the supervision of the SMS [Swedish Standard].

If we take a broad view of these projects, we could say that while the DIN project seeks to satisfy the extremely precise design requirements expressed by users, the NAD and the Swedish projects seem to consider other potential applications to a greater extent.

Compared with the other two projects, the Swedish project appears to be more concerned with making a full set of standards available for magnetic supports—not just the information necessary to exploit CAD for practical applications.

However, let us set these projects aside for the moment so that we can discuss another project, truly European in scope, launched by CEN/CENELEC at DIN's initiative.

With a topic such as this and the fact that Europe's internal frontiers will be opened in 1993, one can imagine just how hot an issue this is! And indeed, it is.

September 1987: CEN/CENELEC decided to create a European working group called "CAD Standard Parts Library" which was to "develop a series of European standards defining a European library of standard parts stored in a neutral numerical form that can be accessed by a vast range of CAD systems." DIN will preside over this group and provide it with secretarial services.

Three meetings of the working group have been held since this date. During this time the DIN project was presented on various occasions to the European experts who were present.

But let us return to France and see what has been happening here over the last few years.

French Choice

In France, the background to the creation of standards for CAD parts libraries can be summarized in five choices; only the last one of these was really decisive.

In 1983, encouraged by a number of industrialists, AFNOR decided to raise the subject. At that time, two aspects were considered: upgrading standards and promoting the introduction of CAD within the PME/PMI [small and medium-sized companies/small and medium-sized industries]. Between 1983 and July 1985 discussions were held with the professional sectors concerned—almost exclusively in the mechanical sector—and these discussions led to the following conclusions:

— It was necessary to define methods for describing the characteristics of parts, both those covered by standards and those not covered;
— It was necessary to systematize the way in which industrial catalogs are presented;
— Proposals had to be made in order to reach an agreement at the European level.

Let us not discuss the highly premonitory nature of the third conclusion, and let us point out that it was in July 1985 that the effects of the DIN project were first felt in France.

The second choice was that of industry. In October 1985 a standards committee was set up to deal with this issue, testifying to the desire to go ahead.

The third choice is uncertain. In June 1986, after a small number of meetings, a summary of information on the DIN project was provided and initial contacts were made with the Institute's directors. Work at the national level was frozen so that should it be necessary, the project could be redefined or clarified based on the DIN's experience. The national project was put on hold following a French mission to the FRG.

—September 1987: fourth choice. Faced with the fact that the work of formulating European standards was imminent, AFNOR decided to take up the subject again. This time, the stakes were clear: what was in the balance was Europe.

Our committee started activity again with an additional 20 sources of information. A patient job of gathering information was undertaken in the three major sectors of CAD "consumers:" mechanics, electricity/electronics, and BTP [Construction/Public Works]. The message was brutal but clear:

— The creation of European standards for CAD parts libraries will lead to a standard description of parts;

— The nature of the description method depends on the ways in which the basic information (i.e., product standards and industrial catalogs) is organized and on the type of information to be taken into consideration (size, functions, etc.);

— Failure to take part in the work done at the European level places at risk the ability to integrate certain types of information (for example, information

issued under national standards) in the library; it also means running the risk of allowing a library to be created which does not meet national requirements.

A group to prepare proposals was mobilized within 3 months. In January 1988, 110 representatives of various national organizations concerned with this issue formed a study group, referred to as the "Group of 110."

This group brings together leading representatives of the mechanics, aeronautics, automotive, electricity and electrical engineering, electronics, BTP, and armaments sectors. It also includes representatives of companies supplying CAD, companies developing applications, specialized study centers, and institutional representatives.

The role of the group is to define national strategy concerning French, European, and international standards in this area. A 13-member technical committee (BDC/CAD/CT 1) provides the technical know-how of the Group of 110 in matters pertaining to European standardization, in order of priority.

After several exchanges it was the Group of 110 which made the fifth and last choice: after examining the proposal made by the DIN at the European level, which had a number of technical limitations, the Group of 110 decided to propose an alternative, which is currently being developed. This alternative is described below.

French Committee Proposal

The creation of standards for parts libraries, as perceived in France, must ensure that the methodology and the programming principles are defined in such a way that:

— Standards organizations can describe, acquire, store, and distribute all the data contained in the standards;
— Parts manufacturers can assess the conformity of their parts to the standards and consequently, can describe, acquire, store, and distribute all the data contained in their catalogs;
— Industries can do the same with their internal standards;
— Users can exploit this data for those applications that are theirs by right.

What is meant here by "parts" are any group of elements, subgroup of elements, or elements described in a document or set of documents such as norms, industrial catalogs, or company standards—examples include screws, bearings, transistors, electric motors, partitions, windows, etc.—utilized in any design process.

To achieve these objectives, five elements must be addressed:
— parts identification systems,
— methods for describing the characteristics of parts,
— data storage and distribution formats,
— software interface for generating the geometry, and
— quality assurance and maintenance procedures.

System of Identification

The system must be capable of identifying each part individually, regardless of the industrial sector to which it belongs; it must also take into consideration parts with different origins (standards, country, supplier).

Method of Describing the Characteristics

The methods of description must define the data structure and the logical links between the data, based on a dictionary of parts and classified by family.

The methods of description must not prejudge characteristics attributed to a part in a product standard and must make it possible to take specific data into consideration, particularly "image" (symbol, nondimensional representation, text, etc.), "formula" (in the form of algorithms), or "geometric" data.

Storage and Distribution Formats

The formatting that is used must be neutral and relational.

Software Interface

The software interface must permit the library to support programs written in interpretative or compiler languages.

It must be possible to construct the 2-D and 3-D means of transmission and 3-D volumetric configurations of the parts stored in the memory.

The interface must allow the transmission of the identifying codes and characteristics.

Quality Assurance and Maintenance

The defined procedures must ensure that the information can be traced and must permit verification of the information for conformity.

Additional Aspects

With the methods and tools that have been defined it must be possible to:
— create identifying codes;
— add specific characteristics to the parts memorized in the library while simultaneously ensuring that the information can be transmitted.

Finally, the rules must be structured in such a way as to permit the acquisition, storage, distribution, and exploitation of the information relating to a given family of parts without the necessity of having the entire library available.

Conclusion

Although characteristically French in its search for perfection, this proposal comes in the context of the creation of a single European market in 1993.

In this way, it complies with the general objective established for the creation of European standards. At the same time it defines a certain number of technical points intended to ensure that the parts libraries of the future can develop.

If the French approach is to be successful, the industrial sector will have to join forces and work together.

Major efforts have been achieved in this area, and at this point we should acknowledge the contribution made by the representatives of very different companies who have now reached an understanding as a result of talking to each other.

Two questions still remain to be answered:

- In the final analysis, does the formulation of standards fall within the scope of a project of this kind?
- What does the future hold for this project?

It seems that the answer to the first question is self-evident if one compares the unrealistic situtation—only too real, unfortunately—mentioned at the beginning, and the reasonably acceptable future outlined by the work of standardization already underway.

One can no longer let it be said without reacting that the creation of standards does not form part of a project whose progress makes it more important as each day passes.

There can be no doubt that this standardization effort will result in a substantial redistribution of the market. Similarly, it is not surprising that certain people involved in sales, who today are in a privileged position, speak out against this process of standardization.

But let us not mix our terms. The work undertaken at the European level invalidates any arguments concerning the advantages—already widely acknowledged by users of CAD—to be derived from the creation of standards.

It is for this reason that we have no hesitation in placing managers of companies and the people concerned with this issue in all industrial sectors on their guard against all those who have a commercial interest in the idea that it is not possible to create standards for CAD parts libraries.

Also, we will not fail to mention that the most useful way for us to take part in the European discussions is to go to these discussions armed with a project.

In connection with the second question—What is the future of this project?—we believe that publishing the necessary standards will only be the first step. Because if we are to take full advantage of economies of scale, avoid the duplication of data, and provide valid and reliable information, we still need to organized the sources of collection, acquisition, validation, and distribution in an information network at a truly national level, or even at a European or world level, i.e., on a level with the CAD market itself.

Increased R&D Funding Largely Compensates for Inflation

35190011z Paris LE MONDE in French 22 Sep 88 p 17

[Article by Jean-Francois Augereau: "The Research Budget: A 7.6-Percent Increase for 1989"]

[Text] Mr Mitterrand had promised it during his election campaign. Mr Rocard had confirmed it, recalling in June that scientific and technical research, somewhat neglected by Mr Chirac's government, was a "long-term priority investment." Now it's done. Mr Rocard's government has kept its promises and allocated an increased 1989 budget to the Ministry of Research and Technology—plus 7.6 percent in current francs, i.e., far more than required to make up for inflation.

The civil R&D budget, the well-known BCRD, which Mr Chirac's former minister of research, Mr Alain Devaquet, had questioned and replaced by the broader concept of R&D budget effort (EBRD), was allocated a total of Fr42,287 million (compared with Fr39,309 million in 1988) for program authorizations (investments) and operating expenditures (operating credits and salaries). Similarly, payment appropriations (+7.9 percent) were increased from Fr19,500 million to Fr21,040 million for 1989.

These figures should satisfy the scientific community, which, in 1986, had to bear the brunt of the budget cuts decided by the services of the minister delegate in charge of budget, Mr Alain Juppe. At the time, these cuts accounted for over one half of all canceled appropriations in the state budget, all ministries taken together.

Priority to Employment

This had set the tone, and subsequent budgets did not give research any priority—so much so that BCRD appropriations were increased by only 2.3 percent this year, and it was only through his obstination that Mr Devaquet's successor, Mr Jacques Valade, obtained the creation of 150 researcher jobs. But no new jobs were included in the 1988 budget for engineers, technicians, and administrative personnel (the ITAs), whose numbers were reduced by 0.9 percent although they are badly needed in some sectors.

It is not surprising, therefore, that scientific jobs are given priority in the 1989 budget. A priority that the minister of research, Mr Hubert Curien, had already emphasized by earmarking some of the Fr830 allocated to him by the advance budget decree for the creation of 150 researcher and engineer jobs (LE MONDE dated 10 June). With the new budget, therefore, a total of 918 new jobs will be created. Of these, 600 should be reserved to researchers, the rest to the ITAs, thus offsetting ahead of time the slow aging of the research personnel and the gaps that will be left after the next retirement waves. In addition, 950 promotions are planned—enough to replace those who will retire, with a special effort on grants and allocations to ensure, in Mr Curien's words, "that the young French men and women who are gifted and inclined to pursue a career in research can do so more easily."

Although it is clear that jobs and appropritations will benefit mainly public organizations of a scientific and technical nature, such as the CNRS [National Center for Scientific Research], the INSERM [National Institute for Health and Medical Research], the INRA [National Institute for Agronomical Research] and the ORSTOM [Bureau of Overseas Scientific and Technical Research], which are, to say the least, in a difficult situation, the minister of research did not forget to provide generously for the Research and Technology Fund. Indeed, it is largely through this fund that he can reorient the research policy toward the goals that he feels deserve some support. As a result, the FRT, which had received an additional Fr500 million in program authorizations last June, will increase from Fr930 million to Fr1,220 million.

Military Gets Quarter of FRG's 1988 R&D Budget

36200043x Munich SUEDDEUTSCHE ZEITUNG in German 28 Oct 88 p 6

[Text] The Federal Government will, through 1988, expend every fourth DM budgeted for science, research, and development to support military research and technology. By the end of the year this will amount to 2.8 out of nearly DM11.8 billion, some 24.5 percent of the total. In 1982, the last year of the social-liberal coalition's budget responsibility, expenditures were substantially lower. Military research spending amounted to 1.6 of the DM9.8 billion total, the military's share of total R&D spending being some 16.3 percent.

Military research ranked third among major research budget categories, following general university research [DM7 billion] and research devoted to industrial productivity and technology. Expenditures for the latter category amounted to DM3.4 billion. Military research received some 16 times as much funding as did the environment, protection of nature, and reactor safety, the Ministry for Environmental Affairs and Reactor Safety receiving only DM173 million for research.

In the 441-page "Federal Research Report 1988," currently under discussion in the Bundestag defense committee, there are no precise details on "Support Category X," covering military research and technology. Only three columns contain information concerning research goals and priorities. Highlighted are the development of new weapons systems, "development of new properties for military materials," military medical research and protective measures against NBC warfare. In addition, earlier priorities have been carried forward.

Current international developments such as new requirements within the area of arms control, particularly the growing demand for reliable verification technology, are not mentioned in the tasking catalog for military research. This is indicated by the government in its annual "Research and Technology Guidelines" of the Ministry of Defense. These, however, are classified as "confidential" and not accessible to the general public.

Italy: Enichem R&D Activities, Strategies Summarized

3698m529 Milan CHIMICA OGGI (Dossier Enichem) in Italian Jul-Aug 88 pp 1-2

[Excerpts] Enichem S.p.A. is the leading chemical sector of the ENI group and carries out the financial, management, and strategic coordination of sectorial activities assigned to the companies it controls.

Enichem's production takes place in 35 plants located in Italy and four located abroad: two in Great Britain, one in Germany, and one in Portugal.

Research and Development

The completion of the Princeton Center for advanced materials is of particular importance for research and development. A series of projects in the fields of functional and structural materials have also been defined. New laboratories have been set up at San Donato Milanese and Monterotondo (Rome).

Agreements and Joint Ventures

Enichem is acquiring greater standing in the field of basic products and specialties through the creation of joint ventures. It is also expanding other activities through agreement and purchases. Enichem has signed several key agreements in the last two years:

— The founding of EVC, a joint venture with ICI for the production and marketing of vinyl monomer chloride and polyvinyl chloride. This makes it the largest European producer;

— A preliminary agreement concluded in the USSR by Montedison,Occidental Petroleum, Marubeni, and Soviet partners for the creation of a petrochemical plant in Tengiz for a total of $6 billion;

— A feasibility study for the construction of a 250,000 ton, virgin-fuel oil cracker [as published] and production of polythene, polypropylene, and butadiene to be set up on the Chinese island of Hainan;

— An agreement with Arco Chemical for the production of a thermoplastic styrene elastomer in the United States and the production of Dylark construction resins in Italy;

— Two agreements with Dupont, one for marketing Dupont health products in Italy and the other for the joint production of polyethlyene tubes for gas pipelines;

— Ten percent participation in Saudi Basic Industries for the production of MTBE in Saudi Arabia;

— A joint venture with Olivetti and Italtel for the manufacture of laminates used in printed electronic circuits;

— A joint venture with the Japanese company Mitsubishi in the field of fluoroderivatives;

— An agreement with Norquisa and Petroquisa for the production of chemical intermediates in Brazil;

— An agreement with Pequiven for the production of MTBE in Venezuela;

— An agreement with Dow Chemical Co. for the production of epoxide resins in Italy.

This year the Enichem Group will continue to invest in agreements, joint ventures, and acquisitions in the sectors where the Group's strategies have been defined.

Norwegian Budget Bill Includes Added Funds for Space Research

Oslo AFTENPOSTEN in Norwegian 4 Oct 88 p 31

[Article: "Space Program Funded"]

The government has proposed an appropriation of 178.4 million kroner for space activities next year, compared with 173.8 million for this year. Of the total amount proposed, 130.4 million kroner are to be given to the European Space Agency (ESA). Seventeen million kroner are to be set aside for national programs which would place Norwegian space research in a position to utilize our ESA membership in the most advantageous manner. Twenty-six million kroner are to be used for building up a so-called infrastructure for our space research, and 5 million kroner for bilateral programs between Norway and countries in the ESA and outside of it.

SUPERCONDUCTIVITY

EC To Spend 3.2 Billion ECU for Superconductivity Research

3698m006 Milan INDUSTRIA OGGI in Italian Sep 88 p 12

[Text] The discovery of high-temperature superconductivity prompted a transnational European research effort to study the basic properties and potential applications of superconductors. Superconductivity research to date has been carried out by small groups of scientists and has never been paid the attention it deserved. Now, thanks to EC action in favor of superconductivity, several R&D initiatives have been taken involving various companies and groups of scientists; 3.2 billion ECU has already been appropriated for this purpose. The European Community established a linkage between Joint Research Center programs and those concerning telecommunications and the information technology industry. In addition, some ESPRIT and CODEST members will contribute to the development of this project. European universities will also be involved in this important research effort to improve the prospects for technological development in a highly strategic sector. The independence from electrical resistance made possible by the superconductors will lead to dramatic changes in the telecommunications, microelectronics, computers, and transport systems sectors.

FRG Researchers Develop Superconductive Thin Film

36980066b Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 14 Oct 88 p 8

[Text] Aachen—Workers at the Institute for Film and Ion Technology at the Nuclear Research Facility Juelich GmbH (KFA) have succeeded in developing an unusually simple and fast process for producing thin, high-temperature superconductive film. In the method, a high-powered laser is used to wear down and evaporate the high- temperature superconductor. With this achievement, KFA Juelich considers itself "a world leader" in fundamental research for information technology.

The equipment used to produce this film is very simple. It essentially consists of a vacuum vessel filled with oxygen (approximately 1 torr). The laser beam, which is focused through a lens, enters the chamber through a window and encounters there a black sintered body made of the new superconductor. This sintered material is produced by the Institute for Solid-State Research of KFA Juelich. The sintered specimen is position on the lower end of a rotating axis. Rotation provides for a more balanced wear of the superconductive material.

The excimer laser that is used has a wavelength of 248 nanometers, thus in the ultraviolet range, and can only emit the light by pulse with a repetition frequency of no

more than 30 hertz. The energy for a 40 nanosecond long pulse is no more than one joule; this would mean a continuous level of 400 megawatts. This high-energy laser beam strikes the sintered superconductor and evaporates or wears down the material. These evaporated individual atoms or larger atom clusters fly away basically perpendicular to the sintered material and strike the substrate to be coated, which is on a furnace that can be heated up to 1000 degrees Celsius. On the way to the substrate, the partially excited atoms release their energy in the form of an intense purple plasma light.

The major advantage of this process over other methods that produce qualitatively similar, high-quality superconductive film is its simplicity and speed. A substrate is installed, superheated, vapor- deposited and dismantled in less than 5 minutes. All the time-consuming aftertreatment required with other methods are unnecessary here. The result is superconductive film with complete, sharp superconductive junctions above 92 Kelvin. Thus, the film has the exact properties of the source material. Moreover, the thin film has another important property, a high current-carrying capacity. Thus, film can be deposited on substrates made of $SrTiO_3$ that can transport more than 1.5 millions ampere per square centimeter at 77 Kelvin, with no loss. This value is comparable to the best Japanese and American results.

The resulting film is polycrystalline with a preferred c-axis orientation perpendicular to the substrate surface, both on monocrystal strontium titanate and monocrystal (random orientation) zirconium oxide. Unlike other methods, laser volatilization makes it possible to produce film only 10 nanometers thick with outstanding superconductive features. The universality of the process leads one to assume that it will also be possible to successfully apply it to other alloys with high melting points.

New French Superconductivity Research Center

3698A347 Paris FRENCH TECHNOLOGY SURVEY in English Jul-Aug 88 p 3

[Report entitled "Superconductor Research Centre"]

[Text] A research centre for superconducting materials will be operational by the end of 1988 in Caen. It will be one of three such centres in the world, the other two being at Houston (United States) and Tokyo (Japan). This centre will be the interface between the laboratory and national and international companies. The scientific group includes the General Management of the French Scientific Research Centre (CNRS), Rhone-Poulenc, and CGE [Marcoussis Laboratories] as well as the scientists in Caen.

Lower Normandy now has an additional expert tool which is added to the GANIL [Grand National Heavy Ion Accelerator], the CIRIL [Interdisciplinary Research Centre into Heavy Ions], the CYCERON [Biomedical Research Centre for Tomography by Positron Transmission], and the ISMRA [Institute for Material and Radiation Sciences].

TELECOMMUNICATIONS R&D

French, U.S. Firms To Produce CMOS Integrated Circuits Jointly

36980041b Paris L'USINE NOUVELLE in French 6 Oct 88 pp 76- 77

[Article by Alain Dieul: "Franco-American Chips for the ISDN [Integrated Services Digital Network]"]

[Text] SGS-Thomson and National Semiconductor pool their complementary knowhow to develop ISDN-specific integrated circuits jointly.

In Geneva, National Semiconductor and SGS-Thomson just announced that they were both joining the exclusive club of ISDN-specific integrated circuit manufacturers. Their goal is to become world leaders on a booming market that will amount to $7 billion in 1992, i.e., one tenth of the world market for communication equipment.

The alliance between the two groups is based on the use of high-density CMOS [complementary metal-oxide semiconductor] technologies for the production of integrated circuits; they would provide users with a dual production source, the knowhow of the two partners being complementary.

On the telecommunication network market, National Semiconductor is a major supplier of controllers for local-area networks of the Ethernet type and for connections to IBM mainframes. Since it acquired Fairchild, last year, the U.S. company also enjoys a strategic position in the field of high-speed ECL [emitter-coupled logic] technology ASICs [application-specific integrated circuits] for communications.

As for SGS-Thomson, it has a long experience of dedicated electronic components for telecommunication applications. The European group is one of the leading world producers of circuits for telephones, automatic branch exchanges and modems. It produces mixed CMOS-bipolar technology circuits at the Carolton (Texas) plant it inherited from Mostek. The association, on a single chip, of CMOS data-processing and bipolar signal-processing circuits is one of the keys to the production of ISDN circuits. In addition, the French-Italian group, which is a partner of Alcatel, takes part in the European debates on the standardization of ISDN connection procedures, as do Italtel, Plessey and Siemens.

The two companies have committed considerable resources to the development of ISDN products. Already, over 80 design engineers are coordinating their research in Santa Clara (California) and Grenoble. Together, they are developing several integrated circuits, including a transceiver and a complete kit designed to interface data-processing terminals with the ISDN.

National Semiconductor just announced that, in the United States, it will make a complete ISDN laboratory available to users to carry out their tests and test their interfaces.

In spite of all these resources, the National Semiconductor/SGS-Thomson partnership may be coming somewhat late. Actually, although the market has hardly taken off yet, other large manufacturers have already secured strong positions: Fujitsu, NEC, Siemens and Intel (the latter has been marketing a line of ISDN circuits since 1986). Jean-Claude Mathon, technical director at National Semiconductor, stated: "We are on time, for until now standards were ill-defined, and currently no one is offering products compatible with the latest standards."

COMPUTERS

GDR's EC 1834 PC Enters Serial Production

23020031 East Berlin MIKROPROZESSORTECHNIK in German No 10, 1988 p 290

[Text] The Ernst Thaelmann office machine plant in Sommerda has just commenced serial production of the new EC 1834 16-bit computer. The computer, which has 2-2.5 times the memory capacity and processing speed of the PC 1715, was jointly developed by several enterprises of the Robotron Combine as well as collaborators from other entities and enterprises involved in electrical engineering and/or electronics.

The technological preconditions for the serial production of the new personal computer, bearing the "Q" quality symbol, were worked out in Sommerda, concrrently with the development of the product. That included the development of special software for electronic test engineering and measurement technology.

This year, the collectives of the office machines plant in Sommerda will manufacture more than 28,000 personal computers. Of these, 5,000 will be of the new type [EC 1834]. Moreover, the EC 1834 will also be produced at the accounting machine works in Karl-Marx-Stadt.

DEFENSE INDUSTRIES

New Yugoslav-Made Multiple Rocket Launcher Developed

36980077a Belgrade BORBA in Serbo-Croatian 8 Nov 88 p 10

[M. Dinic report: "Our New Weapon"]

[Text] Following the requirements of the modern theater of war [vojiste] in which rocket artillery is the main form of fire on the ground, our military experts have developed a new self-propelled multiple rocket launcher—ORKAN. The first steps in developing this modern weapon have been made by the Ground Forces Military-Technological Institute in Belgrade. After working persistently over several years, a top-level weapon system was constructed in the sphere of multiple launchers.

This rocket artillery piece is mounted on a Yugoslav-made truck that has eight-wheel drive and an automatic tire-pressure regulation system which ensures high level of mobility and cross-country ability under all conditions. This enables it to quickly change its firing position. After firing one or two salvos, this powerful long-range launcher moves from one firing position with great speed to another, previously chosen site. The weapons effect is fatal so the enemy is going to search for the launcher by all possible means—ground and air—in order to destroy it. Because of this, the vehicle carries a 12.7 millimeter anti-aircraft machinegun on the roof of its cabin, while the crew is armed with modern infantry weapons. The maximum weight of the whole system is 32 tonnes.

The weapon itself has 12 tubes. The caliber of the rocket launcher is 262 millimeters. Ingenious innovations and modern design enable quick firing and reloading of the weapon. The range of the destructive rockets fired in ripple fire is about 50 kilometers. The rockets' accuracy is increased by wrap-around stabilizing fins. They are folded around the projectile's body during transport or loading and unfold upon leaving the barrel. The projectile has a cassette [kasetni] warhead. It can successfully destroy all kinds of targets: personnel [ziva sila], strong fortifications, combat vehicles, armored transports....

The best firing accuracy is achieved when the rocket launcher is in a horizontal firing position. If the terrain is uneven, ORKAN is automatically adjusted for successful firing. All preparation activities are performed automatically—as desired by the operator seated at the command panel. A modern fire control system enables such a mode of activity.

Its attributes have ensured the self-propelled multiple rocket launcher ORKAN an important place in our ground forces' action. Its effect on the potential enemy' second and third echelon would considerably slow down the action of these forces.

Therefore, one can easily say that our country is one of the four countries in the world whose knowledge and technology enable them to meet the requirements of the modern theater of war in the sphere of multiple rocket launchers which are the foundation of the artillery of the future.

FACTORY AUTOMATION, ROBOTICS

Plans For Flexible Production Cell For Rotating Machining Discussed

25020001a Budapest GEP in Hungarian No 3, 1988 pp 82-87

[Article by Ferenc Erdelyi and Tivadar Koos, Heavy Industry Technical University: "A Few Problems of Developing Rotating Body Machining Cells"]

[Excerpts] The ratio of bodies of rotation continues to be significant in parts manufacture. One modern tool for automated manufacture is the flexible manufacturing cell. A grouped technology approach offers the best solution for design of a cell. The cell control is capable of continually monitoring cell operation.

Constructing a Cell for Training Purposes

The developmental plans of the Mechanical Engineering School of the NME [Heavy Industry Technical University] include creation of a model system which will serve training and research and development goals in regard to flexible manufacturing systems. This will include construction of a rotating body manufacturing cell.The existing machines of the Machine Tools Faculty and of the Machine Manufacturing Technology Faculty—an ERI-250 disk lathe and an EEN-400 center lathe—and a lathe center to be acquired will form the elements of the cell to be constructed. Naturally certain modifications and additions must be made to the machines (e.g., chip removers, a hydraulic chuck and automatic tailstock, a tool exchange system, etc.).

An RB-241 four-axis robot is available to feed workpieces. Later the system will be expanded with an overhead robot.

The storage of workpieces between operations (also the loading and unloading station) will be by means of a combination of a three-position race track shaped store and pallet stores. A cell control based on a microcomputer will ensure coordinated operation of the equipment.

When realizing the cell functions we will attribute special importance to realization of integrated material and data processing, cell control and cell monitoring. The chief functions of the planned cell control can be seen in Figure 3. The cell control will be the node for a factory network (LAN) which, according to plans, will operate as a training informatics system in shop hall C/2 of the NME. Additional computer workstations, CAD, CAPP, and PPS designing stations, will also belong to the informatics system. A computerized simulator for the cells is being prepared; this will make possible observation of cell operation (on a graphic screen) and will provide experimental possibilities for development of the cell control algorithms.

Flexible manufacturing cells are some of the most important tools for the automation of parts manufacture. The technological nucleus for cells to manufacture bodies of rotation is one or more NC lathes or a lathe center. The other cell functions are related to material and information handling and to auxiliary operations. An iterative approach based on the grouping parts offers the best solution for the design of a cell. Installing a cell requires a circumspect investment decision. The return is a function of the extra profit which can be realized. Integrated material and data processing, that is the real-time software modules working in the cell control, makes an evaluation of the operation of the cell reliable. Cells to machine bodies of rotation can be built up gradually. We intend to get experience with this by building a training model system.

Hungary: MON.KEY, Modular Monitoring System for NC Manufacturing

25020001b Budapest GEP in Hungarian
No 3, 1988 pp 92-95

[Article by Peter Bartal, Laszlo Horvath, Laszlo Monostori, Gabor Pasztirak, Janos Soos and Balazs Szabo, of MTA SZTAKI (the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences): "MON.KEY, Concept For A Modularly Expandable, Complex Monitoring System"]

[Text] The article describes the MON.KEY modularly expandable, multiprocessor machine tool monitoring system which can be programmed from an NC program, developed jointly by MTA SZTAKI and VILATI [Electrical Automation Institute].

Monitoring during operation and the recognition of errors which arise are basic conditions for the operation of highly integrated manufacturing systems which work with little or no supervision. By far the greater part of the errors which arise are mechanical in nature (tools broken or worn, bad grasping of the workpiece, overheating, etc.) so the control of the machining must be accompanied by a monitoring of the characteristic parameters of the machine tool and the machining process.

In Hungary, within the framework of an OMFB [National Technical Development Committee] contract, enterprises manufacturing equipment (SZIM [the Machine Tool Industry Works], the Machine Tool Factory of the Csepel Works, VILATI and DIGEP [the Diosgyor Machine Factory]), the Machine Industry Automation Main Department of MTA SZTAKI and several university faculties (the BME [Budapest Technical University] Machine Manufacturing Technology Faculty and the NME [Heavy Industry Technical University] Machine Tools Faculty) began coordinated research and development connected with the monitoring of machine tools and manufacturing systems.

The SZIMFI manufacturing cell was designed within the framework of a contract titled "Development of Computer Aided Diagnostic Methods, Devices and Systems for Machine Tools." In connection with this, for the first time in our country, we had as our goal operation without human supervision for at least one day shift.

Within the framework of MTA SZTAKI and VILATI cooperation, we began development of special monitoring options (tool monitoring, vibration monitoring, heat monitoring) which can be integrated into CNC and we began development of complex subsystem monitoring equipment which involves, in addition to special modules, units carrying out monitoring tasks of a general character.

The modularly expandable machine tool monitoring system described, which can be programmed by the user, could be a precursor of universal monitoring equipment which could be used for automatic monitoring of manufacturing cells in the near future.

Goals

Monitoring the machining process and machine status is an extraordinarily difficult task as there is no unambiguously descriptive model of either the process or the machine status. For this reason the functioning of the monitoring equipment is based on an examination of accompanying phenomena (force, pressure, output, vibration, heat, acoustic emission, etc.). Most of the equipment attempts to track status and recognize error states by measuring and processing a single signal, so this equipment—considering that one characteristic approximates the actual process with only a certain precision—can carry out its task—monitoring the process or machine—only under limited processing conditions and with only limited precision. A real improvement in regard to the efficiency and utility of monitoring equipment can be expected only with the simultaneous observation of several characteristics.

The basic requirement made of monitoring algorithms is that they can be executed under real-time conditions, which in many cases limits the sphere of methods which can be used. The situation is different when executing diagnostic tasks, when the goal—going beyond the recognition of an error—is identification of a machine tool state or error. In general the task can be done outside the machining process, so real-time evaluation is not a requirement, but what is important is a correct determination of the machine state and a precise, complex evaluation of several characteristics. The monitoring-/diagnostic equipment must be capable—in various operating states—of carrying out both types of task mentioned above.

The basic factors in developing monitoring/diagnostic equipment are:
- it should be capable of measuring and processing a number of signals of various types with various dynamics,
- it should make possible a high degree of preprocessing of the signals, including analysis within the frequency domain,
- it should provide a method for complex evaluation of various signals and making complex decisions,
- it should be modular and expandable, with a structure which can be reorganized, in the interest of a good match to the given task,
- it should make possible the programmability of the monitoring and diagnostic functions, and
- by use of appropriate teaching and learning procedures it should ensure the good operability of the system and aid a determination of monitoring methods which can be used under the given machining conditions.

On the basis of the above we at MTA SZTAKI had as our goal the development of multiprocessor equipment which would be capable of measuring various parameters (tool load, vibration, heat) and of fast evaluation of them for process monitoring, and of complex machine state classification by summing and evaluating the data provided by the several modules.

Hardware/Software Structure of the Monitoring System

The sensing and processing of the many physical quanities, changing dynamically with different speeds, accompanying the status of the machine tool and the machining process is a task requiring significant computer capacity. The multiprocessor structure of the machine tool monitoring equipment makes possible a division of the logically separable tasks and their parallel execution in modules with independent microprocessors.

Accordingly the monitoring system consists of the following main parts (see Figure 1, Structure of the MON-.KEY System):

—a communications module,
—a control module, and
—monitoring modules

Data traffic between the monitoring system and the external world (CNC, DNC) takes place on a standard serial line—in the interest of easy matchability. The task of the communictions module is management of the data transmission line (or lines), preliminary processing of the data received and production of feedback in the appropriate format.

The control module provides control of the internal working of the system, the handing on of processed messages and their distribution among the monitoring modules; a combined evaluation of the characteristics measured and the making of complex decisions take place in this module.

The task of the monitoring modules is basically the measurement and preprocessing of individual process or machine characteristics, or coherent group of such characteristics, doing preliminary monitoring checks and making decisions. Thus separate modules perform tool monitoring tasks (drive monitoring and broken tool checks), heat monitoring tasks and vibration monitoring tasks. In addition to the special modules it is also possible to connect general purpose modules to receive and process analog and digital signals.

The modules are made up of two main parts (see Figure 2, Hardware Structure of the Monitoring Cards). They consist of a general microprocessor part of uniform structure and of special hardware for electric matching

and digitizing of the physical characteristic to be measured. The microprocessor unit controls the operation of the monitoring module and maintains contact—via a uniform hardware/software interface—with the control processor.

The task of the tool monitoring module is, in addition to a general measurement of the load on the machine tool, execution of the usual tool monitoring functions—tool load, tool wear check, broken tool check and AC.

The module determines the load on the machine by measuring the current to the motors of the main and auxiliary drives, which is suitable for a monitoring check during an operation. Between operations the broken tool check checks the integrity of the cutting edges of the tool with an inductive contact switch.

The task of the heat monitoring module is to prevent overheating of the machine tool, and checking the thermal behavior of the machine. The module measures the temperature of critical points of the machine tool with the aid of semiconductor heat sensors.

The vibration monitoring module concludes faulty operation on the basis of vibrations arising during machining. The module processes the signals of acceleration sensors located at appropriate points of the machine tool within a frequency range. A digital signal processing processor (DSP) performs a real-time spectrum computation, working in parallel with the general purpose microprocessor (see Figure 3, Structure of the Vibration Monitoring Card). Data traffic between the two processors takes place in a common memory area. While the DSP computes the spectrum of the data for a given time interval the general purpose processor concludes the current vibration state from a further analysis of the previously computed spectrum.

The structure of the monitoring system also makes possible the connection of additional modules. One can use general purpose modules with the aid of which it becomes possible for the user to measure other characteristics important for him, with an individual or complex evaluation of the data measured.

The software for the modules differs substantially because of their different tasks. But some of the tasks are necessary for every module and are frequently repeated. It would be superfluous to rewrite these functions separately every time; it is better to create a small uniform "operating system" or software kernel in every module, making the writing of the unique operating software of the modules much simpler.

There is no software kernel (hereinafter the real-time kernel) satisfying our requirements for the given processor type so we began development of our own kernel, giving far-reaching consideration to portability. Despite the fact that the individual modules of the multiprocessor monitor differ greatly from one another in both hardware and function we strove for a uniform treatment. The real-time multitask kernel developed also simplifies switching to another hardware environment.

By decomposing the tasks to be performed one can find a number of easily distinguishable parts. These partial tasks, independent of one another but depending on one another in logical function, form the operating software of the modules. During operation the kernel schedules the running of the tasks as a function of external conditions. The kernel provides general functions which serve to coordinate and schedule the tasks, process the events and manage the input/output processes.

By creating a kernel the emphasis when designing the software of the individual monitoring modules is on development of the monitoring algorithms and decomposition of the tasks. Breaking the process down into individual tasks is very important because it greatly influences the efficiency of the given module and of the entire monitoring system.

The advantages of the kernel are:

—it reduces programming time,

—it simplifies tracing,

—it accelerates software planning,

—documenting the system is simpler, and

—it can also be used in different tasks.

By creating a real-time kernel one gets a uniform software interface in all modules for the programs, independent of the physical structure.

Programming the Monitoring System

Almost without exception the industrial level machine tool monitoring equipment presently used is aimed at a relatively narrow area (Fanuc, Krupp, Widia, etc.). In most cases these systems can be connected as a supplement to a control-machine tool combination. This supplemental character required that the connection be via a low-level interface, which was possible because of the relative simplicity of the monitoring devices. Thus the devices are programmed primarily with M or G codes, using the the standard interfaces of the controls and the standard NC program language.

The complexity of a multipurpose monitoring system and the large volume of information needed for its operation made necessary the creation of an information channel between the control and the monitoring system and the development of a more complex programming structure. The multiplicity of information pertinent to the monitoring system and the need to make programming convenient for the user both justified an expansion of the NC language in regard to monitoring.

The functioning of complex monitoring/diagnostic equipment is closely linked to the machining process, so there is a need to provide states of machining, technological data defining the process and the parameters of various monitoring algorithms. The most important data types necessary for monitoring equipment are:

— data describing the machining running on the machine tool (program start and end, sentence start, etc.),

— technological data, and

— commands controlling the operation of the monitor.

A large part of the data characterizing the machining is provided by the CNC equipment on the basis of the NC parts program, with an awareness of the current state of operations. The commands pertinent to monitoring are not evaluated by NC sentence processing—since they deviate from the normal NC sentence format—so these must be given in a separate sentence, isolated from the NC commands. The NC forwards the sentences to the monitor without change and it checks and processes the monitoring sentence. The monitoring sentences must be inserted between the sentences of the parts program, directly in front of the NC sentence to which the monitoring sentences pertain.

The instructions figuring in the monitoring sentences can belong to four types:

- Value providing instructions, which set the value of a logical or arithmetic variable,
- Monitor configuring instructions, with the aid of which the parameters describing the operation of the monitor receive values, and set the monitoring option to a mode corresponding to what is desired; the configuring instructions can be instructions prescribing processing, characteristic computation or a decision,
- Monitor control instructions, the task of which is to control the functioning of the monitoring system, that is the activation of the several monitoring functions, and
- Supplementary instructions, which provide special programming information pertaining to the data, for example setting programming states, data format, etc.

When programming the monitor—in the case of the same type of machining—one can count on the frequent repetition of certain instruction groups. This problem can be solved by use of so-called subprograms. The subprograms one desires to use can be defined with suitable supplementary instructions at the head of the monitoring program; they are activated in the appropriate parts of the program with a subprogram calling instruction.

The actual interpretation of instructions pertaining to monitoring, translating them into the internal language of the monitor, takes place during the actual running of the parts program, that is during machining. Naturally this translation operation includes a check of the program.

If the monitor discovers some error—whether a syntactical problem in the monitoring sentences or a faulty machine state—it sends a signal to the CNC.

The more important feedback provided by the monitor includes:
— intervention instructions (shutdown, override modification),
— indications pertaining to the functioning of the monitor, and
— data describing the process or machine state.

With the aid of these the monitor can intervene in the process or can indicate the current machine state, aiding the checking and maintenance of the normal state.

Use of the Monitoring System

The complex monitoring equipment described is capable—because of its hardware/software structure and programmability—of carrying out both monitoring and diagnostic tasks. But the two types of tasks differ from one another from the viewpoint of both operating mode and external information traffic.

Design and realization of the monitoring tasks falls in the sphere of technological planning. The system gets the input data pertaining to machining from the parts program, but the monitoring algorithms can also use the limit values and parameters obtained through earlier learning. On the basis of this the system executes the prescribed real-time monitoring algorithms and it intervenes in the machining if it deviates from the given conditions. The method of intervention can be an automatic correction of the machining (in the case of AC regulation), sending a warning to the operator or computer directly observing the machining process (in the case of tool wear) or interruption of the process (in the event of a failure).

When executing diagnostic tasks the system provides information for shop-level leadership or maintenance. Then the programming of the system—formally similar to the monitoring mode—is done with the aid of a test parts program which contains the machine cycles necessary for error definition and the appropriate monitoring program parts. Measurements done for diagnostic purposes can have as their goal:

—a regular check of the general machine state,
—error seeking to discover the cause of some failure, or
—a rough check of machine status during machining.

The advantage of diagnostic tests done during machining or in the dead time of machining is that they can offer a relatively continuous picture of the machine state and they do not require extra time. Their disadvantage is that this method is suitable for a sketchy, rough check of machine state, because there is no possibility for separate test motions and there is no time to activate the more complex diagnostic algorithms. The basic problem is caused by—in addition to the increased computer demand—the programming of the diagnostic tasks, because at such times the diagnostic program details must be inserted into the parts program, where they do not logically fit. This task can be solved by a CAD/CAM system with a uniform information system.

In the case of systematic machine state checks the organization of diagnostic measurements does not represent a problem, because methods and test procedures are available to shop level guidance and maintenance planning, methods and procedures which must be used periodically or when an error phenomenon is indicated. Fitting the diagnostic procedures into the production process does not run into difficulties either, because activating them happens outside the machining process.

The existing diagnostic equipment and devices record a few characteristic physical parameters of the machining process. After comparing the measured values to simple limit values the process is graded as faulty or fault-free.

A method much more flexible than this and better able to follow reality is to have the monitor track the machine state with the simultaneous measurement a number of process indicators and to take into consideration in the decision the given or even learned parameters of the machining step then running. The monitoring equipment described here can be easily connected to a CNC control which is capable of the necessary communication. Programming it is entirely flexible and every function can be set in the desired operating range.

The MON.KEY monitoring system jointly developed by MTA SZTAKI and VILATI can aid to a significant degree the development in Hungary of reduced supervision machining cells and can contribute to increasing the exportability of Hungarian machine tools and controls.

LASERS, SENSORS, OPTICS

New GDR Optoelectronic Sensor Described

23020027 East Berlin FEINGERAETETECHNIK in German No 10, 1988 pp 443-444

[Article by H. Priplata and R. Kuechler of the Research Center at VEB Carl Zeiss Combine, Jena: "The KKR Optoelectronic Sensor—A New Sensor for Measuring Coordinates"]

[Text] Automatic measurement requires sensors that receive the measured signals quickly and accurately. This requirement and a number of others are realized in the KKR optoelectronic sensor. The precursor of this sensor was the FEM photoelectric sensor, which was especially well-suited for manually operated dual-coordinate sensors (ZKM series)[1]. Both sensors were developed in close cooperation with the Friedrich Schiller University in Jena.

Characteristic Features

The KKR optoelectronic sensor, with its higher performance parameters, replaces the FEM, even in terms of retrofitting equipment. It is essential to the automated optical measurement of structures. The sensor features the following advantages:

- optoelectronic, contact-free sensing - nondirectional sensing of structures - objectified measurement with dynamic measured value acquisition - high productivity, due to sensor speeds of up to 20 mm/s on the object plane - high accuracy - quick conversion by exchanging the reticle insert for the KKR insert - extensive range of applications - fatigue-proof work, even with manually operated equipment.

Design and Operation

The optoelectronic sensor consists of an insert in which the circle- circular ring sensor (KKR) is located. This is positioned in the mount of the coordinate sensor in such a way that it is on the focal plane of the microscope. The circle and circular ring have the same surface dimensions, and the diameter of the sensor is 1 mm. If a structure is moved across the receiver, coincidence occurs when the light currents are equal, and a pulse triggered by this effects recording of the machine coordinates. The KKR is thus a null indicator, which in transmitted light can be used for almost any structure. The measurement signals are further processed in an electronic unit.

Potential Applications and Measurement Uncertainties

For recording the dimensions of 2D structures (slight extension along the z-axis), calibration is not necessary. This includes, for example, linear structures (lines and cracks) with smallest intervals of less than or equal to 50 µm with an adjusted aperture of 0.14. The smallest measurable line width is 8 µm. If one uses 20 x, 10 x and 5 x lenses, sensor uncertainties of S_{20} less than or equal to 0.2 µm result, as long as a measuring speed of V_M less than or equal to 2 mm/s is not exceeded. For a larger V_M, sensor uncertainty is somewhat higher.

Measuring 3D objects requires an adjustment because of optic-geometric sensing errors[3]. In addition, the z-extension of the measured object must be considered for prismatic components. Both for these and for cylindrical bodies (range of diameter 1 to 125 mm), suitable calibration normals are available. If edge quality is very good and one uses 10 x or 5 x lenses, measurement uncertainties of U = +/- (1.3 to 2) µm result. Measurements of drill holes are possible for diameters of d

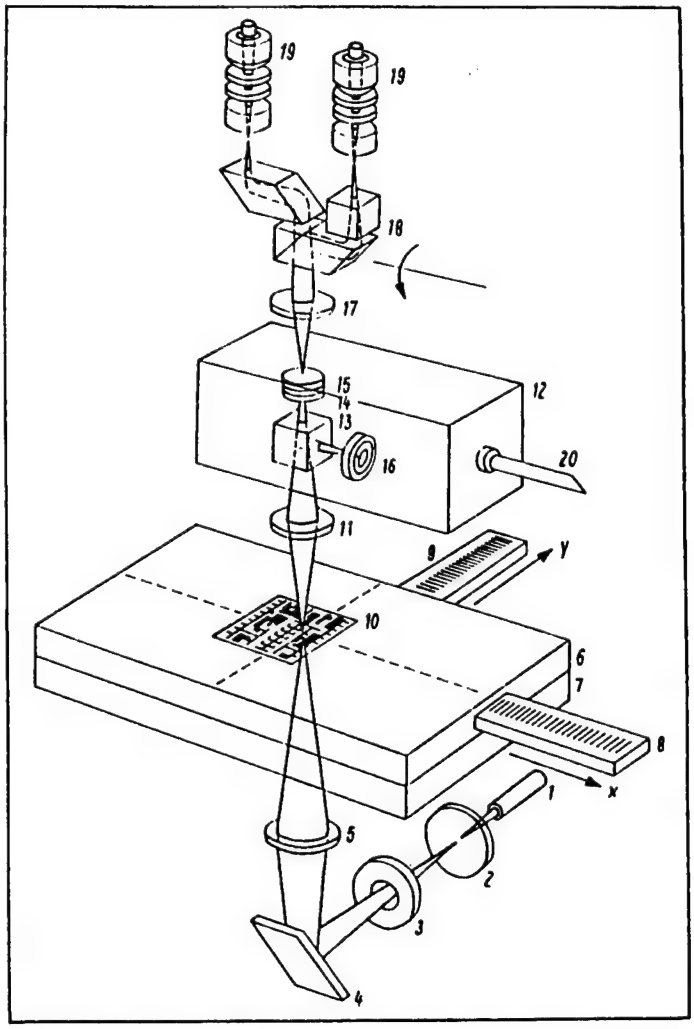


Figure 2 Optical layout and path of rays of the ZKM with KKR insert

Key:
1.Fiber-optic waveguide
2.Collector
3.Aperture diaphragm
4.Tilted mirror
5.Condenser
6.x-carriage
7.y-carriage
8.Scales
9.Scales
10.Object plane
11.Lens
12.KKR insert
13.Divider cube
14.Field lens
15.Ring mark
16.KKR sensor
17.Intermediate projection system
18.Prism combination
19.Eyepieces
20.Cable

greater than or equal to 1 mm (20 x lens) without an additional curvature-dependent adjustment.

In general, external dimensions are measured too large and internal dimensions are measured too small.

Under incident lighting, measurements of highly reflective objects are possible with directional reflection and good contrast. Tests have shown that objects with directional reflection, a contrast of K greater than or equal to 0.8 and a reflection factor of greater than or equal to 8 percent can be measured. If the contrast is K greater than or equal to 0.5, then objects with a reflection factor of greater than or equal to 45 percent can still be measured. This is achieved by using the enhanced luminosity vertical illuminator.

In practice, it is possible in many cases to ignore the above adjustments, since the process tolerances so allow (e.g., for punched or turned parts, templates or blanks). Wherever

required by quality assurance, a computer-assisted evaluation should be conducted in order to effectively structure the measurement process in question.

Technical Data

Standard deviation (transmitted light)	+/- 0.2 µm
Measurement speeds (object plane)	1 to 20 mm/s
Minimum interval between edges	
(lens 10 x)	60 µm
(lens 20 x)	40 µm
Separation measurements	
for line widths (lens 20 x to 1 x)	8 to 400 µm
for crack widths (lens 20 x to 1 x)	10 to 400 µm
Total measurement uncertainties with ZKM 01-250 CM in µm	
2D objects	+/- (1.7 + 2.8 x 10^{-6} x L)
3D objects (object height greater than or equal to 5 mm)	plus or minus (1.8 + 2.8 x 10^{-6} x L)
	(with L in mm)
Power input	15 VA
Supply voltage	220 V/127 V + 10 percent, - 15 percent
Dimensions in mm / weight in kg	
KKR insert	140 x 100 x 32 / 0.9
Electronics insert	310 x 100 x 330 / 5.5

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Overview of 'Smart' CCD Sensor for GDR Measurement Technology

23020024 East Berlin FEINGERAETETECHNIK in German No 10, 1988 pp 450-454

[Article by Dr M. Koehler and H. Helms of the VEB Center for Research and Technology in the VEB Combine Special Technology, Dresden: "Smart CCD Line Sensor for Production Measurement Technology"]

[Text] Imaging processing on the basis of CCD technology has recently undergone rapid developments. The design of the CCD image receiver is oriented towards a microcomputer coupling and is thus appropriate for solving various problems of automated flexible production.

In order to achieve a wide range of practical applications for CCD technology, smart sensors based on simple CCD image receivers must be created that satisfy the demands of stability, speed, flexibility and accuracy involved in automated production, and at a low cost. One significant area of application for these sensors is the geometric inspection of parts during the production process. The smart CCD line sensor was developed on the basis of these goals.

1. Measurement Principle and Area of Application of the Sensor

The measurement principle of the smart CCD line sensor is based on the idea of selectively recording only the information necessary for measurement in conjunction with movement of the object, thus minimizing the relevant calculating time. This means that the potential processing speed moves into the range of real-time processing, and that because of the possibility of using one-chip microcomputers, low-level image processing systems with low energy consumption and minimal size can be developed. During selective information acquisition, the actual measurement is recorded, together with its organization on the same basis of measurement technology through the coupled evaluation of video signals from several CCD lines, some of which are crossed. Besides ensuring the uniformity of the measurement and organization processes, this makes it possible to flexibly adjust the measurement to the object in question during the measurement sequence. By moving the measured object under an angle with respect to the crossed CCD lines, all the ranges of the dimensions to be recorded can be covered. In this way, the momentary position of the measured object is obtained reciprocally from the video signals, which at the same time are used for the actual measurement.However, perhaps it is sufficient to move the measured object parallel to the CCD line, since, for example, in measuring the length of turned pieces (unlike measuring diameters) information on dimensional ranges larger than those represented by the width of the CCD lines is not necessary. In that case, the software of the one-chip microcomputer is much simpler and the expenditure on the measured object mount device is much less, especially since the process specifies only an upper limit to the speed of measured object movement, which is determined from the minimum number of measured values per dimensional range. In many cases, the movement can be taken from the production process itself. Figure 1 shows the position of the crossed and parallel CCD lines to a sample measured object, and its direction of movement.

In order to support the use of the one-chip microcomputer, a measurement coordinator is needed that edits the video signals to ensure a uniform depiction of all

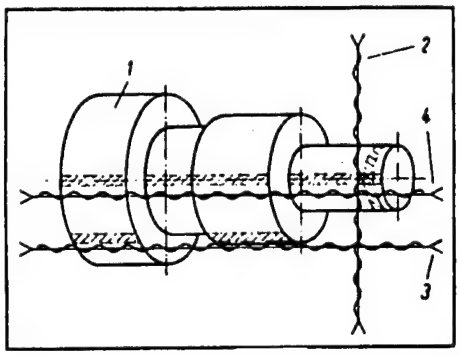

Figure 1. Position of the crossed CCD lines in the image of a measured object

Key:
1. Measured object
2. Diametrical CCD lines
3. Longitudinal CCD lines
4. Overall longitudinal CCD lines
5. Direction of movement of measured object

measurement and organization values as pulse-length modulated signals. This measurement principle is patented (1).

The smart CCD sensor is advantageous for use in the production of hardware if the following marginal conditions are in evidence:- 2D measurement of external dimensions - high dimensional concentration at the measured object - high dimensional variation - frequent switching to other objects - automated measurement without interruption of the production process - measurement of moving objects - easily deformed measured objects

2. Design of the Smart CCD Line Sensor

2.1. Overall Design

The smart CCD line sensor consists of the camera head, its drive and the sensor intelligence, which consists of an analog signal processor, a measurement coordinator and an arithmetic and control unit. Figure 2 shows a block diagram of the sensor.

The design of the sensor meets all the demands put on it due to its use as a sensor in a high-quality data acquisition system for computer-aided quality assurance. Thus, the sensor independently assumes the tasks of measured value acquisition, control and organization of the measuring process, calculating average measured values, comparisons with control values and data transmission to higher computers or printers. The sensor specifies the measurement problem by way of the pertinent software of the arithmetic and control unit as well as the initialization of the measurement coordinator. In this way, depending on the level of specification, the software can be tailored to a concrete measurement object, to similar objects or to a general, simple measurement task.

Because of the form of the analog signal processor, the sensor intelligence is able to balance out certain temporal and spatial irregularities in lighting. The measurement coordinator processes the signals for an acquisition of measured values independent of the movement of the object. The sensor synchronizes itself on the basis of the analysis of the video signal for the concrete measured object, while if necessary it can be synchronized externally as well.

2.2. Camera Head and Drive

Besides the common optical components, the camera head contains the elements of two standard CCD line camera heads, e.g., two CCD lines L 110 C, two line mounts and two drive signal adjustments each. Figure 3 shows an exploded view of the arrangement of elements in the camera head. Besides its compactness and complexity, the camera head is characterized by a heightened degree of mechanical functionality. In the camera head, the cover surfaces of the CCD lines are parallel and orthogonal to the optical axis. This arrangement extends to the external surfaces of the camera head (the frame). This means a reduction in the fixtures needed to adjust the camera head.

The optics consist of a TESSAR 4/24 lens or other special lens and a semipermeable mirror. The splitting of the beam ensures equal geometric ratios between lighting, measured object and camera head for both CCD lines. This means a simplified measured object mount and smaller lighting devices, as well as faster optical adjustment when converting for other measured objects.

The operating voltages and cycles are coupled in and the output signals are coupled out via the drive signal adjustment. One element of the drive is the generation of drive cycles by the universal CCD drive circuit U 5201 PC-118 (2) and the generation of video signals that are designed according to known circuits with differential amplifiers and sample-and-hold circuits.

Sensor Intelligence

The analog signal processor generates from the video signal a binary pulse signal in which a low-high junction is assigned to each image border, represented by the reversal point in the frequency-corrected video signal. Through evaluation of the gray-value information of the video signal, this permits resolution within the photo diode range of the CCD line. This circuitry layout is patented (3). Its function and performance are described in another publication (4). In keeping with the measurement point address requirement of the one-chip microcomputer, the measurement coordinator provides a pulse-length modulated signal (gate) that is proportional to the dimensional value defined by way of the measurement point address. For every measurement point address, the software in the measurement coordinator defines which CCD line opens or closes the gate for which border of the video signal. Using the opening and

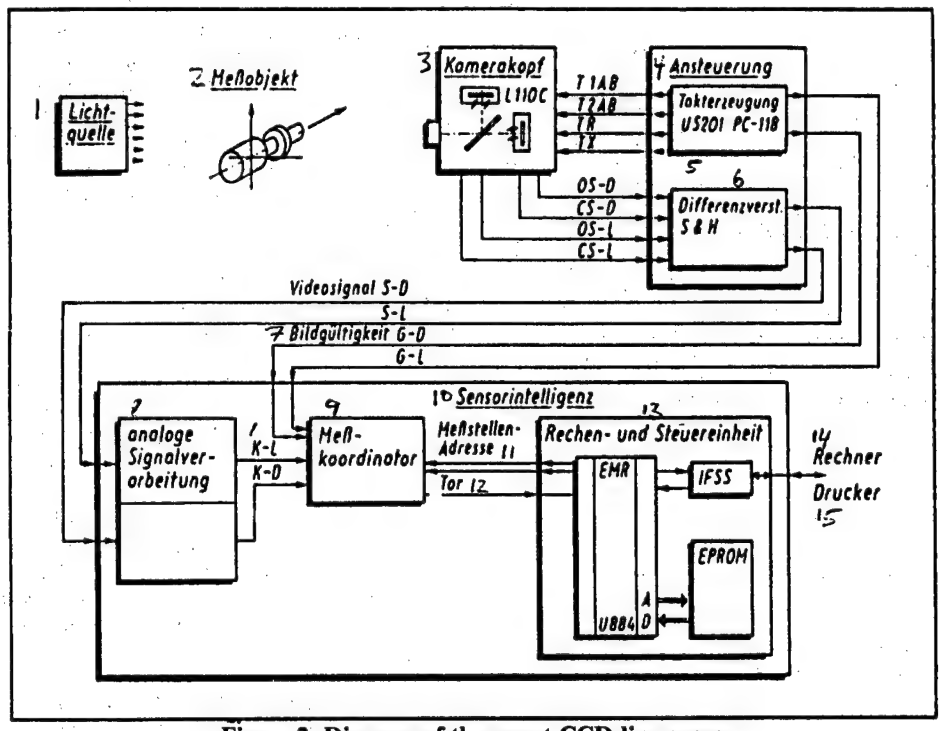

Figure 2. Diagram of the smart CCD line sensor

Key:
1.Light source
2.Measured object
3.Camera head
4.Drive
5.Clocking
6.Differential amplifier
7.Image validity
8.Analog signal processing
9.Measurement coordinator
10.Sensor intelligence
11.Measurement point address
12.Gate
13.Arithmetic and control unit
14.Computer
15.Printer

closing of the gates with different CCD lines, graduated dimensions can be measured without moving the measured object. Forming gates via several image borders also makes it possible to measure block dimensions as a uniform dimension, whereby there is no accumulation of measurement errors. Besides the image borders, the limits to the video validity signals can also assume the function of an image border. In connection with rotation of the measured object, concentric measurements are also possible. Similarly, self-control of measured object movement parallel to the camera head is possible. By establishing the position and length of the video validity signal, these can serve as variable, virtual reference borders or effectively fade out the non-dimensional borders of the device surrounding the measured object. Fading is necessary for use under fixed geometric conditions (e.g., within machines) in order to adjust the image aperture to the device where there is a fixed optical image. Figure 4 shows the three video signals of the CCD lines depicted in Figure 1 and their preprocessing in the measurement coordinator.

For the arithmetic and control unit, the U 884 D one-chip microcomputer is used. The software is modular and permits simple generation of the concrete measurement problem. For very high specification of a measurement problem (e.g., 7 measures in two dimensions), special software is needed. In order to solve more general, easier tasks, a universal software package can be generated. Tables 1 and 2 show the measurement protocols for a highly complex problem (cf. example application, point 4) and part of a solution of the same task through individual measurement using a general diameter measuring program over definable dimensional ranges with input of the parameters of those ranges and of the control value. With its internal counter, the one- chip microcomputer counts the gate of the measurement coordinator required by the measurement point address, and does so at a pace 12 times faster than the pixel rate. Using the measurement point address sequence specific to the particular problem and evaluation of the counter results, the computer assumes control of primary data acquisition and independent organization of the measurement, depending on the concrete object position. Using the calibration factor k obtained in the calibration process, the one-chip microcomputer calculates from the counted values z the measured value $y = kz$, establishes the average value My as an actual dimension I, calculates the actual dimension IA for the nominal dimension N where $IA = I - N$, and services the serial interface.

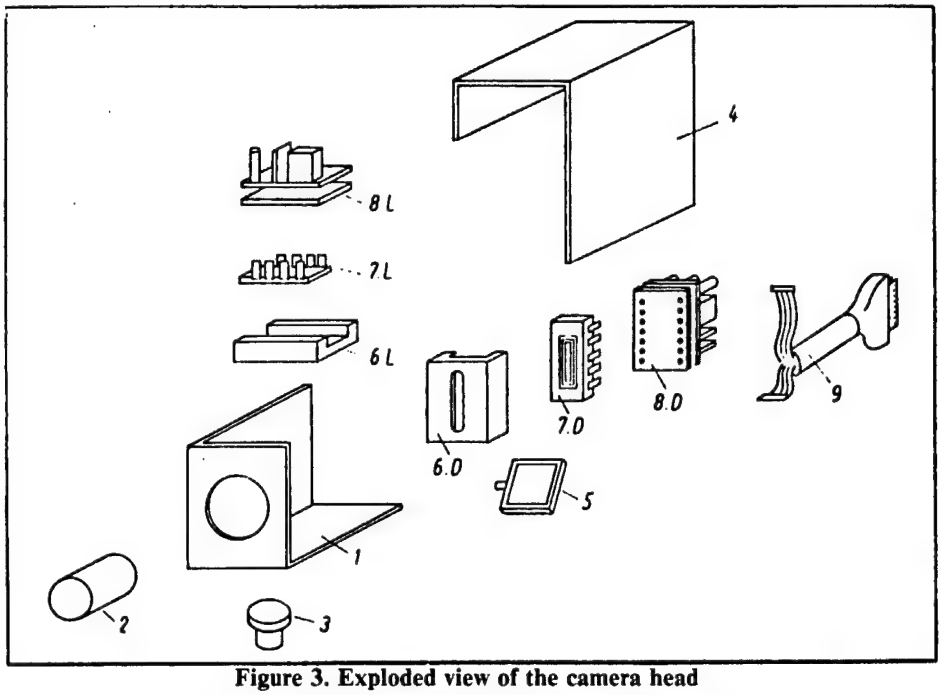

Figure 3. Exploded view of the camera head

Key:
1. Frame—2. Lens—3. Mount—4. Casing—5. Mirror—6. Line carrier—7. CCD lines—8. Drive signal adjustment—9. Connecting cable—D Diametrical CCD lines—L Longitudinal CCD lines

Table 1 Standard protocol; piece dimensions in mm

Dimension 1	2	3	4	5	6	7	Piece no.
05.68	06.72	04.47	00.94	11.43	08.57	10.82	1
05.78	06.78	04.39	01.00	11.45	08.58	10.85	2
05.71	06.81	04.39	00.96	11.53	08.49	10.84	3
05.71	06.81	04.39	00.96	11.53	08.49	10.84	3
05.72	06.81	04.39	00.96	11.52	08.49	10.84	3
05.71	06.81	04.38	00.96	11.53	08.49	10.84	3
05.71	06.81	04.39	00.97	11.53	08.49	10.83	3

Table 2 Measurement of individual dimensions with tolerance in mm

Piece no. 3		
Dimension	Measured value	Tolerance
1	05.73	-0.17
2	06.81	-0.09
3	04.37	-0.03
7	10.84	-0.09

3. Use of the Sensor

The smart CCD line sensor is used as a sensor unit in the BME 2000 contact-free sensor for production control during the manufacture of turned pieces. Figures 5 and 6 show the measurement unit and its most important components. [Figure 6 not reproduced] Figure 7 shows a typical measured object with the dimensions to be determined, and Figure 8 shows the operator control unit, the front panel of which shows the dimensions to be determined.

The turned piece is positioned either in clamped in an advance direction or on two rectangularly indented bearing surfaces outside the defined dimensional range, and is passed by the sensor within approximately 4 s. The bearing surfaces are excluded from measurement by the sensor. During measurement of the diameter, the sensor independently determines the average of the given dimensional range regardless of the dynamics of object motion. This makes it possible, with consideration to the surface structure (tool marks), to establish a connection between the optical (CCD lines) and the full-area, contact (micrometer screw) methods of measuring. With an object distance of 26 mm (determined by the geometric ratios of the lathe), lateral amplification of $\beta = 0.1$, and thus a sensor measurement range of 1 to 30

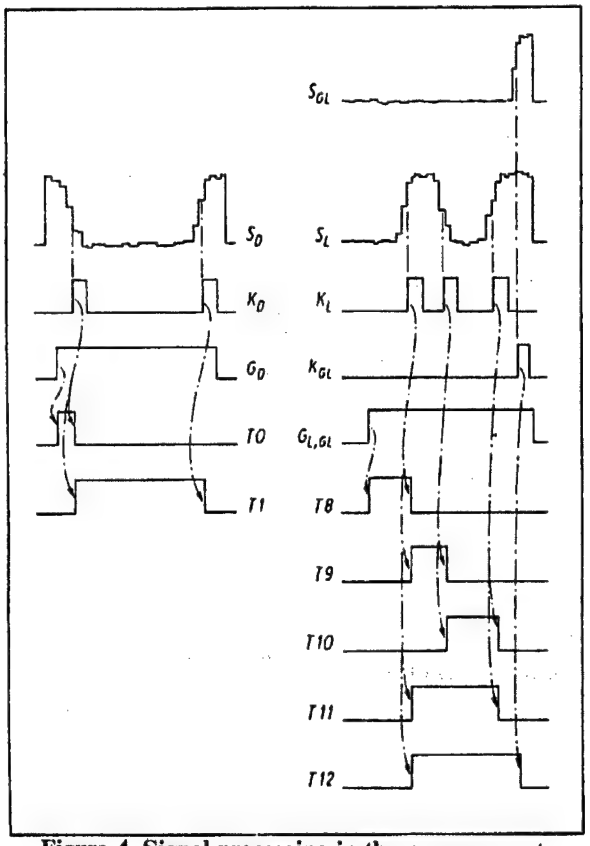

Figure 4. Signal processing in the measurement coordinator

Key: S Video signal—K Image border signal—G Image validity signal—T Gate—D Diametrical CCD lines—L Longitudinal CCD lines—GL Overall longitudinal CCD lines—T0 Concentric dimension—T1 Diameter dimension—T0, T8 Organizational dimensions—T9, T10 Longitudinal dimensions—T11 Block dimension—T12 Graduated dimension

mm can be established. This means that a resolution of 5, and accuracy of +/- 15 is possible. The characteristic curve for the measurement device as depicted in Figure 9 was determined experimentally.

Table 3 shows the average values and standard deviations of the measured values determined in a series of tests (33 repeated measurements) compared to measured results from other methods.

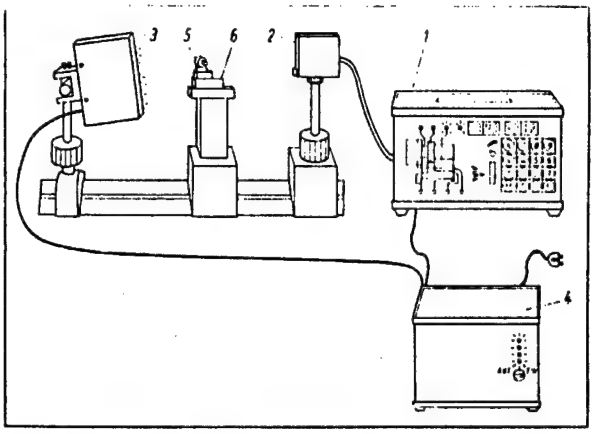

Figure 5. BME 2000 contact-free sensor

Key:
1. Operator control unit
2. Camera head
3. Light source
4. Network unit
5. Measured object
6. Fixture

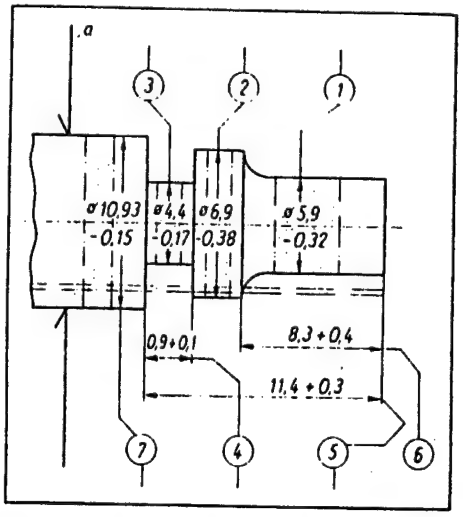

Figure 7. Measured object with dimensions indicated (not to scale) by measurement point numbers, clamps or mounts (a) and dimensional ranges (dotted)

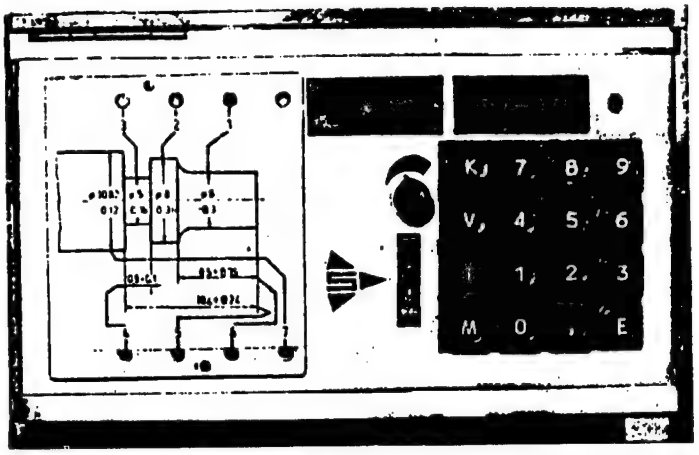

Figure 8. Operator control unit

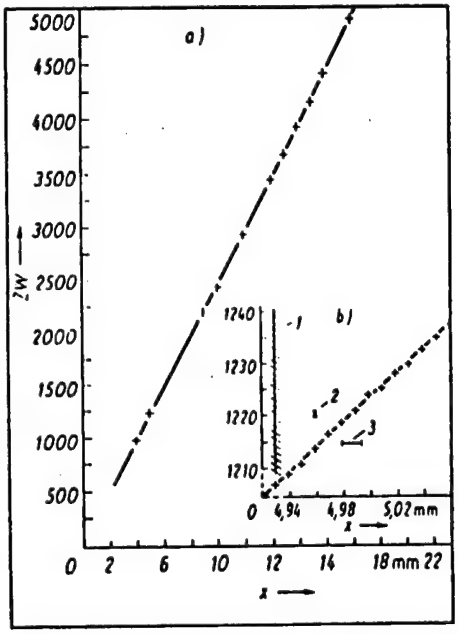

Figure 9. Characteristic line determined experimentally with plug gauge and measuring pin (a characteristic line of the measuring device, b characteristic line segment in the range of a photo diode of the CCD line)

Key: 1 .Width of a photodiode 2. Resolution 3. Measuring accuracy

Table 3 Average values and standard deviations for a series of measurements compared to values for other methods of measurement

Dimension	Measured value, method I (BME 2000)	Measured value, method II (micrometer gauge)	Measured value, method III (measuring microscope)
1	5.797+/-0.005	5.799+/-0.002	5.794+/-0.006
2	6.823+/-0.005	6.874+/-0.007	6.842+/-0.004
3	4.348+/-0.008	-	4.317+/-0.030
4	0.937+/-0.008	-	0.946+/-0.008
5	11.433+/-0.007	-	11.421+/-0.014
6	8.470+/-0.009	-	8.485+/-0.014
7	10.849+/-0.003	10.876+/-0.004	10.854+/-0.010

Table 4 summarizes the most important technical data for the smart CCD line sensor, as used in the BME 2000 contact-free sensor.

Table 4 Technical data for the BME 2000 contact-free sensor

Operating voltage	220 V+/- 10 percent 50 Hz
Power consumption	approximately 30 VA
Error range of the sensor	0.2 percent
Resolution	0.017 percent
Measurement error	+/- 0.05 percent
Measurement range (relative)	40:1
Lateral amplification	β = 3 to 0.01
- recordable maximum length	1 to 330 mm
- at β = 0.1	
resolution	5 µm
measurement error	+/- 15 µm
Max. measurement range	33 to 0.8 mm
Image frequency	300 Hz
Measured value sequence (max.)	150 Hz
Measurement performance	- 7 measurement points - formation of average value via definable dimensional ranges - measurement in two dimensions - incremental dimensions without accumulation of measurement errors - parallel and concentric measurements with virtual reference border
Warm-up time	30 min
Interface	IFFS interface
CCD sensor line	L 110 C (256 pixel)
Lens	TESSAR 4/24
One-chip microcomputer	U 884 D
Clock frequency	7.3728 MHz
Light source	Halogen lamp 12 V/100 W opal glass disk
Dimensions in mm	Camera head 90 x 35 x 90 Light source 80 x 120 x 240 Operator control unit 240 x 120 x 240 Network component 240 x 160 x 240

4. Summary

The design of the smart CCD line sensor makes it possible to use CCD lines to perform a two-dimensional measuring task in production measurement technology with adequate precision, a high level of flexibility, a large variety of parts and at an acceptable cost, even under production conditions. The intelligence of the process ensures not only primary data acquisition, the calculation of measured values and the formation of average values, but also organization of the concrete measured object position. This means a reduction in demands on the device in terms of moving and recording the measured object. The sensor is able to satisfy high demands for automation, objectifies quality control and is a basic element of computer-assisted quality assurance.

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MICROELECTRONICS

Yugoslavia Introduces New IC Line

36980047a Belgrade YUGOSLAV ECONOMIC REVIEW in English No 9, 1988 p 10

[Text] Electronics Industry (EI) of Nis has been developing microelectronic technologies and products for some years now, and at the beginning of September, it has commissioned the latest lines for the manufacture of integrated circuits in plastic housing. These lines are computerized and automated in all stages of the process. This investment is valued at about U.S. $1.9 million and it will result in a multiple increase of the output in chips and considerably reduced production cost, not to mention the fact that it will rid the domestic manufacturers of the necessity of importing these products, without which any modern appliance is unimaginable nowadays.

This is a very important capital project for the further development of the microelectronics technology in this organization. Zoran Vacic, manager of this plant, said that they have already developed the production of chips fitted in integrated circuits and installed in ceramic housing.

The purchase of the fully automated line has made it possible to make radical changes. Although this factory already had some facilities for the manufacture of the so-called pelps, the fitting and packing of integrated circuits constituted a bottle-neck, which in turn often posed a problem of the Yugoslav manufacturers of electronic equipment. Thanks to this line, the output will be increased by five times and EI will be able to supply

5 million series CD-4000 and CDP-1800 integrated circuits with 14, 16, 20 and 40 outlets and 10 or so million medium-capacity series TO-126 transistors.

NUCLEAR ENGINEERING

International Nuclear Physics Symposium in Dresden

36980077b East Berlin NEUES DEUTSCHLAND in German 28 Nov 88 p 2

[Text] Dresden (ND)—The latest results of experimental and theoretical research on nuclear fission were discussed at the 17th International Nuclear Physics Symposium of the Dresden Technical University, which was concluded during the weekend [26-27 November]. Scientists from 24 countries, such as the FRG, CSSR, France, Japan, the USSR, and the United States, participated in the 5-day deliberations.

In addition to research results which provide, above all, new findings about the physical composition of matter, experimental and theoretical works that contribute to a basically improved understanding of nuclear fission were discussed. They are required in order to perfect nuclear energy technology, for example, in increasing the safety of nuclear reactors, and in the development of future fusion reactors.

SCIENCE & TECHNOLOGY POLICY

CEMA Activities Described

Chemical Industry Protocol Signed

36980077e Warsaw PAP in English 17 Nov 88

[Text] Warsaw, 17 November—The 72d session of the CEMA standing committee for chemical industry ended its 3-day debates here today, which focused on the settlement of co-production and investment ventures in this industry in CEMA countries in the years 1991-1995. The session was concluded with the signing of a protocol.

Chairman of the session Stanislaw Klos told PAP that during the session sides arranged the directions of further activities, chiefly in the sphere of biotechnology, including the research and production of antibiotics, enzymes and hormones, as well as plastics, and materials for electronics.

"Our committee is supervising these fields by taking part in the creation of a complex programme of scientific and technological progress in CEMA countries. We devoted much time to the coordination of investment ventures and cooperation in connection with the planned improvement of structure of chemical industries in our countries. We have a considerable responsibility for the coordination of social and economic plans in the field of chemical industries in the CEMA for the next 5 year period," said Stanislaw Klos.

Conference on Cooperation in Electronics

36980077d Sofia BTA in English 18 Nov 88

[Text] Varna, 18 November (BTA)—The CEMA Committee on Cooperation in the Field of Electronization completed its second session here. Taking part were representatives of Bulgaria, Vietnam, the GDR, Cuba, Mongolia, Poland, Romania, the USSR, Hungary, Czechoslovakia, and Yugoslavia.

They paid particular attention to the implementation of the collective concept on the international socialist division of labour in the 1991-2005 period in the field of electronization on the basis of drafting and updating intergovernmental programmes and agreements. The efforts will be channelled into a more adequate satisfaction of the CEMA members' long-term requirements of electronic components, of modern communications and computing equipment. The agenda also included items related to the coordination of the countries' economic development plans in their parts concerning electronization, the improvement of the economic mechanism of cooperation, the implementation of future-oriented programmes for development of multilateral production specialization and cooperation up to the year 2000, as well as the CEMA Comprehensive Programme for Scientific and Technological Progress.

The session approved a plan for the work of the electronization committee in the 1989-1990 period.

The documents signed include agreements endorsing a programme for techno-scientific work of the International Centre for Informatics and Electronics, its rules and statute, as well as a number of protocols regulating its functions.

Bulgaria-GDR Technology Cooperation Signed

36980077c East Berlin NEUES DEUTSCHLAND in German 17 Nov 88 p 5

[Text] East Berlin (ADN)—The 23rd session of the GDR-Bulgarian Joint Economic Committee was concluded in Berlin on Wednesday [16 November]. The protocol of the session was signed by the heads of the two delegations, Horst Soelle, deputy chairman of the GDR Council of Minsters, and Andrey Lukanov, minister of foreign economic relations of the People's Republic of Bulgaria.

The subject of the session was the further implementation of the "Program of Expanding and Deepening Economic and Scientific-Technological Cooperation Between the GDR and the People's Republic of Bulgaria Through the Year 2000" signed by Erich Honecker, general secretary of the SED Central Committee and chairman of the GDR State council, and Todor Zhivkov, general secretary of the BCP Central Committee and chairman of the Bulgarian State Council in September 1987 and of the agreements concluded by the chairman of the Council of Ministers of the two countries in May

1988. It was concurrently noted that good preconditions for the further development of economic relations between the two countries have been established with the level achieved in cooperation during the current 5-year plan period and with the agreements concluded to prepare the coordination of the national economic plans of the GDR and Bulgaria for the 1991-95 period.

The economic committee discussed the next tasks of cooperation, particularly in the fields of key technologies with the aim of supporting comprehensive intensification of the national economies of the two countries.

In agreement with the comprehensive program of scientific-technological progress of the CEMA member countries through the year 2000, stipulations were set down to promote cooperation in research, development, and production between the two countries, for instance in the fields of comprehensive automation, development of computer technology and new materials, and biotechnology.

Both sides explained the level of cooperation in the fields of electrical engineering and electronics and agreed to continue the work, particularly for the preparation of new accords on production specialization and cooperation and mutual deliveries of equipment, products, and electronic components parts.

In the field of machine tool and processing machinery construction, cooperation will be concentrated on the development, production, and mutual delivery of integrated manufacturing stages, manufacturing cells, modules, and elements, and on the expansion of the mutual exchange of components and completion equipment.

With the tasks agreed on in the field of chemical and biotechnological industry, the work for process technology, design, and production of installations and equipment as well as instrument technology for research and production processes will be intensively continued.

During their stay in the GDR, the members of the Bulgarian delegation visited the Berlin Television Electronics Factory.

Hungary's Central Technical Development Fund Proposed

36980077f Budapest MTI in English 25 Nov 88

[Text] Budapest, 25 November (MTI)—On Friday, Pal Tetenyi, president of the state office for technical development, put forward to parliament the bill on the central technical development fund.

Mr Tetenyi said that the smaller part of central funds available for research and technical development are covered by the state budget and the larger part by the central technical development fund. The fund financed by the contribution of economic organizations has for long been operating according to its purpose. The bill was primarily initiated because the major changes taking place in the system of economic management have surpassed the continuously updated central technical development fund, and the new regulation should be enacted under the law on legislation approved by parliament last year. This is also justified by the role and importance of technical development.

As a major change, the extent of contribution will become irrespective of sectors and organizations, and put on a normative basis. this will put an end to the anomaly of the former regulation that some economic organizations did not contribute to the central fund while other branches, first of all the R&D-intensive engineering and chemical industries, paid disproportionately high sums.

Contribution to the fund is not a tax, the economic organizations will invariably pay it as expenses. The rate of contribution stemmed from the sum envisaged in the 7th 5-Year Plan. The total sum of contributions will remain unchanged, the scope of contributors will be expanded, while some sectors, primarily the above mentioned, will pay lower contributions.

The law will put the system of centralized R and D contributions on more stable and more calculable foundations.

The central technical development fund is to finance projects, instead of institutions. The sums paid from the fund are used exclusively under contracts.

After Mr Tetenyi's contribution the Friday programme of the Hungarian National Assembly came to an end. On Saturday parliament is to continue its work with a debate over the bill on the central technical development fund.

Yugoslavia Bolstering R&D Funding

36980047b Belgrade YUGOSLAV ECONOMIC REVIEW in English No 9, 1988 p 9

[Text] The Yugoslav Federal Committee for Science, General Technology and Information Technology has decided in July to allocate about 39 billion Yugoslav dinars as support to 31 research and development projects. The Committee has at the same time allocated 8.5 billion dinars for 12 programmes of fundamental and applied research, and about 8.1 billion for two projects involved with initial construction of the Yugoslav scientific infrastructure. All these funds have been raised on the basis of a special law, as financial support to the National Technological Development Strategy, the implementation of which is under way.

For instance, the Federal Committee has accepted and is financially supporting three projects of a group of enterprises headed by Ivo Lola Ribar of Belgrade. The projects involved are as follows: Flexible production

technologies and flexible automated factories, Computerized control systems for flexible production system and Development and manufacture of robots having universal application.

Let us present on this occasion the Flexible automated factories project which is going to be funded this year by the Federal Government.

As many as 40 organizations from all parts of Yugoslavia will take part in this project and it will be probably the biggest project receiving Federal financial support. The project involves as many as 22 manufacturing organizations, including five LOLA factories, PRVOMAJSKA of Zagreb, METALSKI ZAVODI TITO of Skopje, MAJEVICA of Backa Palanka and INDUSTRIJA ALATA of Trebinje. Then there are also nine research institutes and as many university departments—LOLA Institute, BORIS KIDRIC of Vinca, MILHAILO PUPIN of Belgrade and PROVMAJSKA and RADE KONCOR institutes in Zagreb, Mechanical and Electrical Engineering departments in Belgrade, Mechanical Engineering and Shipbuilding Department in Zagreb, Technological Department in Maribor, Mechanical Engineering Department in Skopje, Electrical and Mechanical Engineering Department in Split, and Mechanical Engineering Department in Sarajevo.

If the implementation of this project goes according to schedule, the Federal Government will allocate to it about 26.4 billion dinars in the next five years. Evidently, this is a big and important project involving research and development of the conception of compatible flexible production systems for different purposes.

It is also counted on the assimilation of the production of components, modules and automated plants boasting high quality and reliability and developed artificial intelligence software. The ultimate aim is to attain such a high level of development as will allow us to be competitive also in the international flexible automated factories market. Wide application of this technology in the Yugoslav machinebuilding industries would increase their competitiveness.

LOLA and other participants in this project are planning at the same time to educate and train staff for research, development and use of modern technologies. It is already certain that a large number of organizations involved in this and LOLA's other two projects will take part in the research, development and design of flexible automated factories under the conception valid in the COMECON countries. These researches will also serve for the realization of two large flexible automated factories in the Soviet Union in the 1989-1993 period.

TELECOMMUNICATIONS R&D

GDR-USSR Cooperation in Communications Electronics Highlighted

23020001 East Berlin
NACHRICHTENTECHNIK-ELEKTRONIK in German No 9, 1988, pp 323-324

[Text] A good half of the volume of production of the Leipzig Communications Electronics Combine VEB is earmarked for exporting by the enterprises and the foreign trade division of communications electronics. Over 30 percent of this is exported to the Soviet Union and includes such things as equipment and systems of telephone transmission and switching engineering, teleprinters, telephone sets, industrial TV cameras and monitors, biological measurement devices for EKG and EEG diagnosis, short-wave radio technology, electronic measuring instruments, and intercom systems.

This combine gets from the USSR microelectronic components and circuits, among other things. For the transmitting of information, systems having a total transmission capacity for 400,000 channels have been delivered so far. For the relaying of information, switching systems with a switching capacity of more than 5 million call-up units (telephone connections) have been delivered.

Some 22,000 Soviet railway workers can communicate with one another by means of VHF radiotelephone sets of RTE [radio and telecommunications engineering] communications technology. To the already delivered 390,000 RTE teleprinters, another 4,000 to 5,000 are being added annually.

These well-established deliveries and services to the USSR are imparting stability and reliability to the exporting capability of the combine. The 39,000 employees of the combine exert great efforts every day to ensure that the obligations undertaken are fulfilled promptly with products and services of suitable quality and at the same time to find new means and product solutions for our most important and greatest trading partner. Like the GDR, the Soviet Union is following the international trend in putting its efforts into the digitization of communications engineering—that is, into new microelectronic and optoelectronic products with which more telephone conversations and at the same time additional services such as radio and color television programs, data, and texts can be transmitted and relayed.

Scientific and Technical Cooperation Between the GDR and USSR in the Field of Communications Engineering

Back in the 1960's joint research work was already being conducted on an integrated digital communications system and on experimenting with electronic control systems in exchange centers.

The signing in 1971 of the governmental agreement between the GDR and the USSR on creating a Uniform System of Electronic Communications Engineering ushered in a new stage in this cooperation, which is based on a division of the tasks involved. Two historical steps were taken with this agreement: For one thing the transition from electromechanical technology to microelectronics, and secondly the fusing of communications and computer engineering in a new level of quality in the controlling of switching processes, for example in office communications. For this cooperative effort between the GDR and the USSR it was important for such a transition and such a fusion to take place through the efforts of both of our countries—without licenses, without imports from capitalist countries.

Specific consequences from the cooperation based on this governmental agreement included the commencement of production of quasi-electronic remote switching centers in the USSR, with the control assemblies for these coming from the GDR. Moreover production began in the Soviet Union and GDR on the communications system for analog and digital switching ENSAD; it is being used in rural telephone networks in the Ukrainian, Moldavian, Estonian, and Latvian SSR's. This cooperation, as well as the exporting and importing of scientific-technical products, is based on long-range foreign-trade agreements whose contents have been decided on by the combine's research center, the Center for Communications Electronics Research and Technology, and by the institute of the USSR's communications ministry (postal and telecommunications), RONIIS. In the field of scientific-technical cooperation in communications engineering this contractual collaboration has been exemplary.

Tasks To Be Solved in the Future by the Communications Engineers of the Two Countries

In realization of the comprehensive program of scientific-technical progress for the CEMA countries up to the year 2000, the enterprises of the combine are participating in the development and manufacturing of modern communications products.

On the basis of the concluded agreement on multilateral cooperation they are concentrating here on the creation of unified systems

- of digital switching technology
- of digital transmission technology
- of beam waveguide transmission
- of mobile land radio

as well as on the creation of sensors for industrial robots and biomedical measuring instruments.

To that end, bilateral arrangements have been concluded with our Soviet partners for the purpose of realizing subtasks arising from this agreement.

Technical Center of RTE Communications Engineering in Moscow

For some years now the state-owned foreign trade enterprise Electrical Engineering Exports-Imports and the Communications Electronics Combine VEB have been running a technical center in Moscow. This action established a place for meetings, exchanges of experiences, and cooperation directly with our greatest trading partner, the USSR, for the purpose of jointly executing, with a multitude of ideas and examples, the program of cooperation in science, technology, and production extending to the year 2000.

Meanwhile, Soviet specialists, traders, and technical journalists have been meeting with representatives of the combine's enterprises. Press conferences and symposia have been organized, at which the newest products of the GDR's communications industry have been made accessible to a wider public.

At the technical center various workshops have been set up and the training room has been equipped with industrial video equipment. The other rooms have been used for trade discussions, coordination arrangements, for operating the customer service, and for various courses and all-around information purposes. From Brest to Vladivostok, for many long-standing users of RTE communications engineering this center in Moscow-Bibirevo has become an important address.

One aim is to win over new prospective users, above all for the digital technology. A permanent exhibition has been set up to that end.

Modern and Time-Tested Communications Systems and Equipment of RTE Communications Engineering for Equipping the Mukran Ferry Terminal

The small fishing village of Mukran, located between Binz and Sassnitz on the island of Ruegen, is currently developing into an important ferry terminal. By 1990, when this currently most extensive integrated project between the GDR and the USSR in the field of transportation will be completed, more than 5 million tons of goods annually will be shipped on the ferry route between the terminals of Mukran and Klaipeda on the Kurski Zaliv [an inlet of the Baltic Sea in USSR] by six railway-goods ferries and will be transshipped at the ferry terminals.

On 2 October 1986, after just under 4 ½ years of construction time, the new Baltic Sea terminal on the Prorer Wiek [Prorer Bay] was opened up with the commencement of ferry service on the GDR-USSR railway ferry route by the ferryboat "Mukran." Combines and enterprises from all regions of the German Democratic Republic participated and are participating in its construction and equipping, including the Communications Electronics Combine VEB as a supplier of modern communications media and communications

systems. In this connection the combine's enterprise—the Berlin Radio and Telecommunications Installation Construction VEB, Rostock enterprise section—was assigned the task of telecommunications development and communications equipping for the ferry terminal. In the construction phase completed so far the Rostock RTE telecommunications-installation constructors have installed and put into operation comprehensive communications and safety-engineering devices in the various already completed structures of the ferry-railway station and the ferry terminal, such as Ferry Bridge I, the transshipment hall, the axle-changing hall for the appropriate track width, and the signal towers. Among other things installed were a large private branch exchange, a uniform railroad automatic telephone system (Basa system) with 1,700 subscribers, low-channel carrier-frequency equipment for teleprinter, remote-control, and data transmission, teleprinter equipment, intercom equipment, electroacoustic transmission equipment, fire-warning equipment, and clock installations. Other components within its scope of equipping tasks are a VHF radiotelephone and data radio system, which includes a train-shunting radio service and port radio service, and—for the purpose of rapidly performing various operational tasks within the ferry terminal—remote-viewing equipment, a railway-line dispatcher system (a public-address operational telephone network), a central operational intercom system, and a remote conferencing intercom system. In addition, public-address systems were installed that group together at one workstation all the terminal devices of operational telecommunications technology in the railway system. Furthermore, in Mukran and Klaipeda Soviet duplex voice systems of the type RJABINA and central operational intercom systems of RTE communications electronics have been installed and put into operation. Last but not least, the development of the telecommunications system for the Mukran ferry terminal required the laying of an extensive underground cable network over an area of 200 hectares (4 km in length and 1 km in width).

The Rostock telecommunications installation constructors will participate until 1989 in equipping the Mukran ferry terminal and will thus be making their contribution toward strengthening even more the bonds of German-Soviet friendship by way of the planned high-volume exchange of goods between the GDR and the USSR via this railway-ferry connection.

Yugoslav Production of Silicon-Based Cable Components Begins

36980047c Belgrade YUGOSLAV ECONOMIC VIEW in English No 9, 1988 p 10

[Text] TEP Electrical Equipment Factory of Zagreb has started to manufacture cable accessories based on silicon, under a technology applied in Yugoslavia for the first time.

This factory will be manufacturing accessories for up to 110 kW cables, as well as other products in the medium and high-voltage range.

It is claimed at TEP that the new technology, based on the application of silicon, means a great progress because it reduces the product assembly time very much. What this means is best illustrated by the fact that assembly time was formerly one or two months, whereas now it is only 10 days or so.

The first quantities of silicon-based cable accessories manufactured by TEP have already been delivered to buyers.